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DEPARTMENTS OF THE ARMY, HEADQUARTERS, MARINE CORPS, THE NAVY, AND THE AIR FORCE 1 June 2000

WARNING

• Do not carry batteries in pockets containing metal objects such as coins, keys, etc. Metal objects can cause the batteries to short circuit and become very hot.

WARNING

Toxic Material

The image intensifier's phosphor screen contains toxic materials.

- If an image intensifier breaks, be extremely careful to avoid inhaling the phosphor screen material. Do not allow the material to come in contact with the mouth or open wounds on the skin.
- If the phosphor screen material contacts your skin, wash it off immediately with soap and water.
- If you inhale/swallow any phosphor screen material, drink a lot of water, induce vomiting, and seek medical attention as soon as possible.

WARNING

The compass illuminator can be seen by other night vision users.

WARNING

It is critical that the goggles be turned off manually before placing them in the flipped up position in order to avoid detection by the enemy.

WARNING

When installing the headmount over the protective mask, be careful not to break the protective mask seal around your face.

WARNING

The IR source is a light that is invisible to the unaided eye for use during conditions of extreme darkness. However, the light from the IR source can be detected by the enemy using night vision devices.

WARNING

Do not use contaminated eyecups. They must be replaced.

WARNING

EQUIPMENT LIMITATIONS

To avoid physical and equipment damage when using the Night Vision Goggles (NVG) carefully read and understand the following safety precautions.

- The NVG requires some night light (moonlight, starlight, etc.) to operate. The level of performance depends upon the level of light.
- Night light is reduced by passing cloud cover, while operating under trees, in building shadows, etc.
- The NVG is less effective viewing into shadows and other darkened areas.
- The NVG is less effective through rain, fog, sleet, snow or smoke.
- The NVG will not "see" through dense smoke.
- Adjust vehicular speed to prevent overdriving the range of view when conditions of possible reduction or loss of vision exist.

FIRST AID

For first aid or artificial respiration, see FM 21-11, First Aid for Soldiers.

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TECHNICAL MANUAL No. 11-5855-262-10-2* TECHNICAL MANUAL No. 09500A-10/1A TECHNICAL MANUAL No. SW215-AT-OMI-010 TECHNICAL ORDER No. 12S10-2PVS7-11 DEPARTMENTS OF THE ARMY, HEADQUARTERS, MARINE CORPS THE NAVY, AND THE AIR FORCE, Washington, DC 1 June 2000

OPERATOR'S MANUAL NIGHT VISION GOGGLES (NVG) AN/PVS-7B (NSN 5855-01-228-0937) (EIC: IPS) AND AN/PVS-7D (NSN 5855-01-422-5413) (EIC: N/A)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes or if you know of a way to improve the procedures, please let us know. Mail your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms). direct to: Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-5000. The Fax number is 732-532-1413, DSN 992-1413. You may also email your recommendations to AMSEL-LC-LEO-PUBS-CHG@cecom3.monmouth.army.mil. Send your AFTO Form 22 (Technical Order System Publication Improvement Report and Reply) in accordance with paragraph 6-5, Section VI, TO 00-5-1. Forward to Warner-Robins Air Logistics Center/LYGO, 380 2nd Street, Suite 104, Robins AFB, GA 31098-1638. Send your NAVMC 10772 to: Commander, Marine Corps Logistics Base (Code 826), 814 Radford Blvd. Albany, GA 31704-5000. Marine Corps units should also respond to MARCORPSYSCOM ATTN: (CBG) with a copy of the NAVMC 10772 or via Naval message. Send your NAVSEA Form 9086/10 to: Commanding Officer, Naval Ship Weapon Systems Engineering Station (Code 5H00), Port Hueneme, CA 93043-5007. A reply will be furnished to you.

*This manual supersedes TM 11-5855-262-10-2 dated 1 December 1997 and all changes thereto.

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HOW TO USE THIS MANUAL

Usage

You must familiarize yourself with the entire manual before operating the equipment. Read and follow all warning notices.

Manual Overview

The table of contents includes the paragraph number, title, and page number for each chapter. An index provides additional references to the subject contents.

• Special Features

A locator is provided on the right-hand border of the front cover. This gives the location of the information most frequently used. To find the topic OPERATION, open the manual to the correct page by using the black tab on the side of the manual that lines up with the topic OPERATION.

CHAPTER 1 INTRODUCTION

Section I. General Information

1-1 SCOPE

This manual provides operation and maintenance instructions for the Night Vision Goggles, AN/PVS-7B and AN/PVS-7D, hereinafter referred to as the NVG. The NVG is a self-contained night vision device that enables improved night vision using ambient light from the night sky (moon, stars, skyglow, etc.).

1-2 MAINTENANCE FORMS AND PROCEDURES

Department of the Army and procedures used for equipment maintenance will be those prescribed by DA Pam 738-750, as contained in Maintenance Management Update.

Refer to the latest issue of DA Pam 25-30 to determine whether there are new editions, changes or additional publications pertaining to the equipment.

Marine Corps personnel refer to the on-line Marine Corp Publications Distribution System (MCPDS).

Marine Corps Ground Equipment Record Procedures. Marine Corps personnel refer to TM 4700-15/1 for disposition of forms and records required for Marine Corps equipment.

1-3 CORROSION PREVENTION AND CONTROL (CPC)

Corrosion prevention and control of Army materiel is a continuing concern. It is important that any corrosion problems with this equipment be reported so that the problem can be corrected and improvements made to prevent the problem in future equipment.

While corrosion is typically associated with rusting metal, it can also include deterioration of other materials such as contacts, injection-molded plastic, and foam inserts in the case. Unusual cracking, softening, swelling, or breaking of these other materials may be a corrosion problem.

If a corrosion problem is identified, report it using Standard Form 368, Product Quality Deficiency Report. Use keywords such as "corrosion", "rust", "deterioration", or "cracking" to ensure that the information is identified as a CPC problem. Submit the form to the address in DA Pam 738-750.

1-4 DESTRUCTION OF ELECTRONIC MATERIEL TO PREVENT ENEMY USE

For procedures to destroy this equipment to prevent its use by the enemy, refer to TM 750-244-2, Procedures for Destruction of Electronic Materiel to Prevent Enemy Use (Electronics Command). **Marine users**, render the NVG inoperable by smashing, scattering or burying disassembled pieces, burning, or destroying by weapons fire.

1-5 REPORTING EQUIPMENT IMPROVEMENT RECOMMENDATIONS (EIR)

If your equipment needs improvement, let us know. Send us an EIR. You, the user, are the only one who can tell us what you don't like about the design. Put it on an SF 368 Product Quality Deficiency Report. Mail it to Commander, U.S. Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-D-CS-CFO, Fort Monmouth, New Jersey 07703-5000. We'll send you a reply.

Marine Corps personnel are encouraged to submit SF 368 in accordance with MCO 4855.10 (Quality Deficiency Report).

1-6 WARRANTY INFORMATION

Some NVG systems are under warranty. The warranty expiration date label is affixed to the front (objective lens end) of the goggle on the opposite side from the power switch. Report all defects in material or workmanship to your maintainer, who will take the appropriate action.

1-7 NOMENCLATURE CROSS-REFERENCE LIST

Table 1-1 provides a cross reference of common names and official terms. Except in the Appendices, the common names will be used. The official names are used in the Appendices because they reflect the provisioning nomenclature.

Table 1-1. Nomenclature Cross-Reference List.

COMMON NAME

Batteries **Battery Cartridge** Carrving Case Carrying Case Strap Compass Demist Shield Evequard Goggles Headmount Helmet Mount IR Spot/Flood Lens LIF Medium Browpad Neck Cord **Objective Lens Cap** Sacrificial Window Shipping and Storage Case **Tethering Cord** Thick Browpad Thin Browpad **3X Magnifier**

OFFICIAL NOMENCLATURE

Battery, Nonrechargeable Cover, Battery Retainer Case. Infrared Equipment Strapping Compass Assembly Demist Shield Assv Evequard, Optical Goggle Assembly Headset Assembly Mount, Viewer Lens Assembly, Focus Filter, Light Interference Browpad Assy, Medium Cord. Fibrous Cap, Protective, Dust Window. Sacrificial Case, Shipping/Storage Clip, Retaining Browpad Assy, Thick Browpad Assy, Thin Magnifier Lens Assembly

1-8 LIST OF ABBREVIATIONS AND ACRONYMS

AAL BII CAGEC cm COEI CPC CTA DA EIC EIR FM Hrs IR JTA Ibs Ip/mm LED LIF MCPDS MIP MRC MTOE N/A NBC NSN NVG Pam PASGT	Additional Authorization List Basic Issue Items Commercial and Government Entity Code Centimeters Components of End Item Corrosion Prevention and Control Common Table of Allowances Department of the Army End Item Code Equipment Improvement Recommendations Field Manual Hours Infrared Joint Table of Allowances Pounds Line pairs per millimeter Light Emitting Diode Light Interference Filter Marine Corp Publication Distribution System Maintenance Index Page Maintenance Requirement Cards Modified Table of Organization and Equipment Not Applicable Nuclear, Biological, and Chemical National Stock Number Night Vision Goggles Pamphlet Personal Armor System Ground Troops
Pam	Pamphlet
PMCS	Personal Armor System Ground Troops Preventive Maintenance Checks and Services Quantity
Qty Recm	Recommended
Rqr SAMS	Required Standard Army Maintenance System
SF TAMMS	Standard Form The Army Maintenance Management System
TDA	Table of Distribution and Allowances

ТМ	Technical Manual
TOE	Table of Organization and Equipment
U/M	Unit of Measure
ULLS	Unit Level Logistics System
Vdc	Volts, direct current

1-9 GLOSSARY

BLACK SPOTS. These are cosmetic blemishes in the image intensifier or dirt or debris between the lenses.

BRIGHT SPOTS. These can be defects in the image area caused by a flaw in the film on the microchannel plate. A bright spot is a small, nonuniform, bright area that may flicker or appear constant. Bright spots usually go away when the light is blocked out and are cosmetic blemishes that are signal induced.

BROWPADS. Three hook-and-pile browpads are provided to adjust the headmount to fit different head sizes. The thin browpad (large head) comes attached to the headmount and the thick (small head) or medium browpads are stored in the carrying case.

CAUTION. Condition, practices, or procedures that must be observed to avoid damage to equipment, destruction of equipment, or a long-term health hazard.

CHICKEN WIRE. An irregular pattern of dark thin lines in the field-of-view either throughout the image area or in parts of the image area. Under the worst case condition, these lines will form hexagonal or square-wave shaped lines.

DARK (OR DARK AREA). A place in which there is very little light. It does not mean total darkness. Generally, this means conditions similar to a quarter-moon or starlit night.

DARK-ADAPTED. Having ones eyes adjusted to the goggles' output under low light conditions. This takes at least 10 minutes. However, if you have just been exposed to bright sunlight, dark adaptation will take longer.

DIOPTER. A unit of measure used to define eye correction. Adjustments to the diopter adjustment will provide a clearer image in each eye.

EDGE GLOW. This is a defect in the image area of the NVG. This defect is a bright area (sometimes sparkling) in the outer portion of the viewing area.

EMISSION POINT. A steady or fluctuating pinpoint of bright light in the image area and does not go away when all light is blocked from the objective lens of the goggle. The position of an emission point within the image area of the goggle does not move. An emission point should not be confused with a point light source in the distance.

FIXED-PATTERN NOISE. This is a cosmetic blemish in the image area characterized by a faint hexagonal (honeycomb) pattern throughout the viewing area that most often occurs at highlight levels when viewing very bright lights. Fixed-pattern noise is inherent in the structure of the fiber optics and can be seen in every image intensifier if the light level is high enough.

FLASHING. This is a defect in the image area of the NVG. The image appears to flicker or flash.

FLICKERING. See "flashing".

HIGHLIGHT CUTOFF. The goggles will automatically cut off after 70 \pm 30 seconds of operation in daylight or bright roomlight. Individual bright lights (headlights, flashlights, or other concentrated light sources) will not actuate the highlight cutoff function unless focused directly on the highlight detector located on the front of the goggles.

IMAGE INTENSIFIER. An electro-optical device that detects and amplifies ambient light to produce a visual image.

INFINITY FOCUS. Adjustment of the objective lens so that a distant object, such as a star or the point light on a distant tower, forms the sharpest image.

INTERMITTENT OPERATION. This is a defect in the image area of the NVG. See "flashing".

IR SOURCE. This is an IR Light Emitting Diode (LED). When turned on, the IR source provides additional illumination to enhance existing light conditions. Used only for performing nearby tasks.

LIF. This is a light protection filter for the objective lens. Use of this filter will result in a slight reduction in system gain.

MICROCHANNEL PLATE. A current-multiplying optical disk that intensifies the electron image produced by the photocathode.

NOTE. Essential information of special importance, interest, or aid in job performance.

PHOTOCATHODE. The input of an image intensifier that absorbs light energy and in turn releases electrical energy in the form of an electron image.

SCINTILLATION. A faint, random, sparkling effect throughout the image area. Scintillation is a normal characteristic of the image intensifier and should not be confused with emission points. Scintillation is more pronounced under low light conditions. Also called "video noise".

SHADING. The viewed image should be a full circle. If shading is present, you will not see a fully circular image. Shading is indicative of a dying photocathode and is caused by a defective vacuum seal of the image intensifier. Shading is very dark and you cannot see an image through it.

WARNING. Conditions, practices, or procedures that must be observed to avoid personal injury or loss of life.

Section II. Equipment Description

1-10 EQUIPMENT CHARACTERISTICS, CAPABILITIES AND FEATURES

WARNING

EQUIPMENT LIMITATIONS

To avoid physical and equipment damage when using the NVG, carefully read and understand the following safety precautions.

- The NVG requires some night light (moonlight, starlight, etc.) to operate. The level of performance depends upon the level of light.
- Night light is reduced by passing cloud cover, while operating under trees, in building shadows, etc.
- The NVG is less effective viewing into shadows and other darkened areas.
- The NVG is less effective through rain, fog, sleet, snow or smoke.
- The NVG will not "see" through dense smoke.
- Adjust vehicular speed to prevent overdriving the range of view when conditions of possible reduction or loss of vision exist.

CAUTION

- The NVG is a precision optical instrument and must be handled carefully at all times to prevent damage.
- Be careful when leaving the helmet mount in the flipped up position or removing the helmet mount from the helmet, damage can result.

NOTE

When utilizing the NVG for driving purposes, the NVG may not be used in the hand-held mode. The NVG must be worn in the headmounted or helmet mounted position.

The NVG is a hand-held, headmounted or helmet mounted night vision system that enables walking, driving, weapon firing, short-range surveillance, map reading, vehicle maintenance, and administering first aid in both moonlight and starlight. The system allows for vertical adjustment (by using head straps), fore-and-aft adjustment, objective focus, eyepiece focus, and eye span distance adjustment. The NVG is also equipped with an IR source and a low-battery indicator. The NVG will not be turned off automatically when disconnected from the headmount or helmet mount. Turn off the NVG by the power switch. There is also a highlight cutoff feature that cuts off power to the NVG when it is exposed to high levels of light for 70 \pm 30 seconds.

1-11 LOCATION AND DESCRIPTION OF MAJOR COMPONENTS

The NVG includes items shown in Figure 1-1. The Major components are the headmount (Figure 1-1), the goggles, the carrying case, and the shipping and storage case.

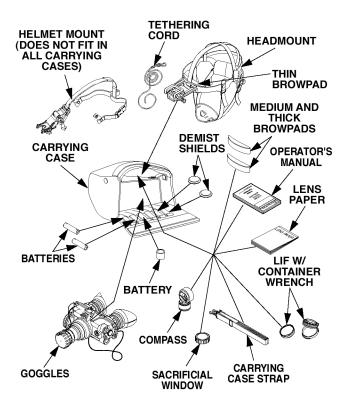


Figure 1-1. Night Vision Goggles (NVG), AN/PVS-7B and AN/PVS-7D (Sheet 1 of 3).

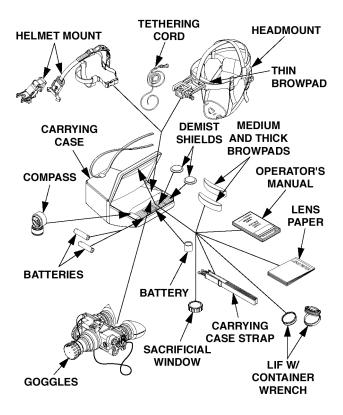


Figure 1-1. Night Vision Goggles (NVG), AN/PVS-7B and AN/PVS-7D (Sheet 2 of 3).

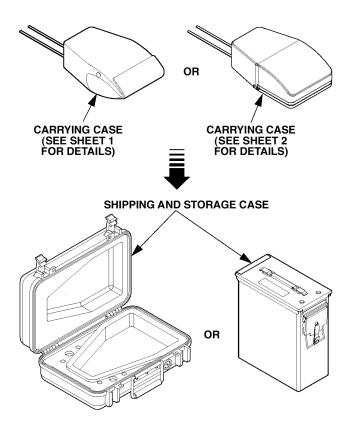


Figure 1-1. Night Vision Goggles (NVG), AN/PVS-7B and AN/PVS-7D (Sheet 3 of 3).

a. Goggles.

The goggles (see Figure 1-2 for breakdown) consist of four primary subassemblies: an objective lens, a wired housing, an image intensifier (not shown), and a rear cover. The wired housing contains a built-in battery compartment, attached battery cap, and the power switch. The goggles also use the accessories listed below:

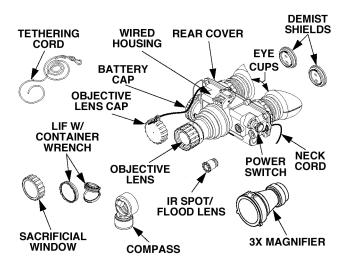


Figure 1-2. Goggles and Accessory Items.

Demist Shields – The two demist shields (Figure 1-2) are used to prevent the eyepiece lenses from becoming fogged.

LIF – The LIF (Figure 1-2) is to be used at all times. For replacing the filter the container is also the wrench. The container/wrench is used to remove and replace the LIF from the objective lens.

Sacrificial Window – A replaceable sacrificial window (Figure 1-2) is supplied to protect the objective lens during operation in adverse conditions.

IR Spot/Flood Lens – This additional authorized item (AAL) (Figure 1-2) focuses the IR light for a narrow beam (spot) or wide angle (flood) beam illumination.

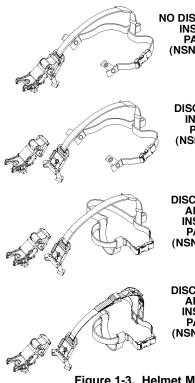
Compass – This item (Figure 1-2) enables operator to see azimuth readings in the goggles viewing area. It is an AAL item for the AN/PVS-7B. It is a Component of End Item (COEI) of the AN/PVS-7D.

Tethering Cord – This AAL item (Figure 1-2) enables the user to attach the compass or 3X magnifier to his/herself to guard against dropping or losing these items.

3X Magnifier – (AAL Item) The 3X magnifier (Figure 1-2) is a lens assembly, which can be added to the objective lens to extend the operator's observation ranges.

b. Headmount. The adjustable cushioned headmount (Figure 1-1) secures the goggles to the operator's head for night viewing and provides freehand support for use with a weapon, protective mask or other purposes. The thin browpad used for large heads, comes attached to the headmount; the thick and medium browpads, used for smaller heads, are stored in the carrying case.

c. Helmet Mount. The helmet mount secures the goggles to the PASGT helmet, allowing freehand support for use with weapon, protective mask or other purposes. The new helmet mount is made of a ruggedized metal. The old one is made of plastic. The metal helmet mount is the only replacement available. Figure 1-3 shows the various versions of the helmet mounts.



NO DISCONNECT FEATURE INSTALLATION PER PARAGRAPH 2-17 (NSN 5855-01-381-6033)

> DISCONNECT FEATURE INSTALLATION PER PARAGRAPH 2-18 (NSN 5855-01-421-7691)

DISCONNECT FEATURE AND NAPE STRAP INSTALLATION PER PARAGRAPH 2-19 (NSN 5855-01-421-7691)

DISCONNECT FEATURE AND NAPE STRAP INSTALLATION PER PARAGRAPH 2-20 (NSN 5855-01-441-0401)

Figure 1-3. Helmet Mounts.

NOTE

The Helmet Mounts can be used with any NVG.

d. Carrying Case. The carrying case is provided for transportation and protection of the goggles, headmount, batteries and accessories. Two slide keeps are provided for belt attachment and three D-rings for shoulder and leg strap attachment. A carrying case strap is also provided which can be attached to the two D-rings on the back of the carrying case. The old case (Figure 1-1) has a hook and pile closure, and the new case (Figure 1-1) has a zipper closure.

e. Shipping and Storage Case. The NVG is supplied in a shipping and storage case (Figure 1-1).

1-12 DIFFERENCE BETWEEN MODELS

The most significant difference between the AN/PVS-7B and AN/PVS-7D models is the image intensifier. The AN/PVS-7B used the MX-10130C tube and the AN/PVS-7D uses the MX-10130D tube with a minimum resolution of 64 lp/mm. Use only the MX-10130D in both models.

1-13 EQUIPMENT DATA

The following tables provide information pertaining to the operational, electrical, mechanical, optical, and environmental characteristics for the NVG.

Table 1-2. Operator Adjustment Limits.		
ITEM	LIMITS	
Interpupillary Distance Diopter Focus Objective Focus	55 to 71 mm +2 to –6 diopters 25 cm to infinity	
Table 1-3.	Electrical Data.	
ITEM	DATA	
Power Source Battery Requirements	Battery (3 Vdc max) 2 AA Alkaline or 2 AA 1.5 Vdc Lithium L91 or 1 Lithium (BA-5567/U)	
Table 1-4. M	lechanical Data.	
ITEM	DATA	
Shipping and Storage Case Carrying Case (Canvas) Goggles (see Note)	Size: Approx. 17" x 12" x 7" Weight: 6.7 lbs. Size: Approx. 14" x 8" Weight: 1.5 lbs.	
NOTE: Weight of the goggle	es does not include accessories.	

ITEM	DATA	
Magnification Field-of-View Diopter Adjustment Focus Range	1.0X 40° +2 to –6 diopters 20 cm (7.9") to infinity	
Table 1-6. Environmental Data.		
ITEM	DATA	
Goggles Operating Temperature Goggles Storage Temperature	-60°F to +113°F	

1-14 MECHANICAL FUNCTIONS

The mechanical functions of the NVG allow for differences in the physical features of individual operators and provide for operating the NVG. These functions include the power switch, interpupillary adjustment, eye relief adjustment, diopter adjustment, IR spot/flood lens and objective focus. The mechanical controls are identified in Figure 1-4.

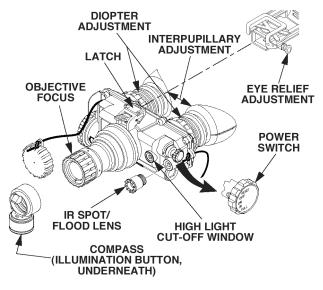


Figure 1-4. Mechanical Controls.

1-15 OPTICAL FUNCTIONS

The optical functions are provided by an objective lens, an image intensifier, a collimator and two eyepiece lenses (Figure 1-5). The objective lens collects light reflected from the night scene by the moon, stars, or night sky, inverts the image and focuses that image on the image intensifier. The image intensifier converts the captured light into a visible image, which is then split and reinverted by the collimator and transmitted to the eyepiece lenses for viewing.

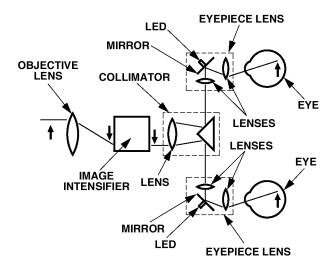


Figure 1-5. Optical Function Diagram.

1-16 ELECTRONIC CIRCUIT FUNCTION

The electronic circuit (Figure 1-6) regulates the direct current voltage from the batteries to the image intensifier and IR source as required. It also monitors the output voltage of the batteries and turns on a low-battery indicator in the right eyepiece when the battery life remaining is approximately 30 minutes (2.4 Vdc).

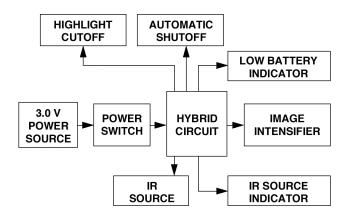


Figure 1-6. Electrical Function Diagram.

a. Power Source. The electronic circuit is powered by replaceable batteries – either a 3.0-volt lithium battery (BA-5567 /U), two AA 1.5-volt alkaline batteries, or two AA 1.5-volt lithium L91 batteries.

b. Electrical Function. Power from the batteries is supplied to the components through the power switch as follows:

- RESET/OFF Position With the power switch in the OFF position, the circuit is not energized from either the image intensifier or the IR source. Also, turn the power switch to this position to reset after highlight cutoff.
- ON Position Power is drawn from the battery compartment to energize the goggles. When the voltage drops to 2.4 Vdc, a low-battery indicator at the right eyepiece blinks indicating approximately 30 minutes of operating time.

WARNING

The IR source is a light that is invisible to the unaided eye for use during conditions of extreme darkness. However, the light from the IR source can be detected by the enemy using night vision devices.

NOTE

Some goggles contain an additional momentary IR function. For momentary IR, continue to turn the power switch clockwise; past ON and without pulling. The power switch will return to the ON position when released.

CAUTION

Do not use excessive force to place the power switch into the momentary IR position.

IR/PULL Position

Power is drawn from the battery compartment to energize the goggles and IR light source and a steady red indicator light in the left eyepiece.

WARNING

It is critical that the goggles be turned off manually before placing them in the flipped up position in order to avoid detection by the enemy.

c. Automatic Shutoff. When some goggles are removed from the headmount or helmet mount while in operation or flipped up in the mount, they will not automatically cut off. They must be turned off manually. To turn the goggles back on, turn the power switch to RESET/OFF and then to ON again.

d. Highlight Cutoff. The goggles will automatically cut off after 70 \pm 30 seconds of operation in daylight or bright room light. Individual bright lights (headlights, flashlights, or other concentrated light sources) will not actuate the highlight detector located on the front of the goggles. To turn the goggles back on, turn the power switch to RESET/OFF position and then to ON again.

CHAPTER 2 OPERATING INSTRUCTIONS

Section I. Description and Use of Operator's Controls and Indicators

CAUTION

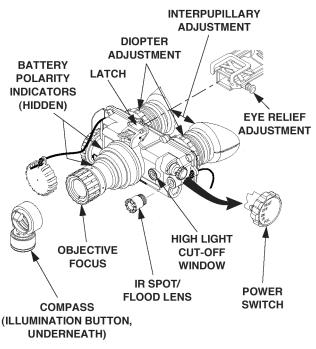
The NVG is a precision electro-optical instrument, so handle it carefully.

NOTE

If the NVG fails to operate, refer to the Troubleshooting Procedures in Chapter 3, Section II.

2-1 OPERATOR CONTROLS AND INDICATORS

The NVG is designed to adjust for different users and controls for most differences in eyesight. The controls and indicators for the NVG are shown or described in Figure 2-1 and Table 2-1.



NOTE - LOW BATTERY INDICATOR AND IR SOURCE "ON" INDICATOR ARE VISIBLE IN RIGHT AND LEFT EYEPIECE LENSES, RESPECTIVELY.

Figure 2-1. Goggles Controls and Indicators.

Table 2-1. Goggles Controls and Indicators.

CONTROLS AND INDICATORS	FUNCTIONS	
Power Switch	Controls goggles OFF.	s and IR source, ON or
	RESET/OFF –	Same as System OFF. Also resets goggles after automatic shut off or highlight cutoff.
	ON –	Goggles activated.
	CAUTION	

Do not use excessive force to place the power switch into the momentary IR position.

NOTE

Some goggles contain an additional momentary IR function. For momentary IR, continue to turn the power switch clockwise; past ON and without pulling. The power switch will return to the ON position when released.

IR/PULL – Pull power switch out and turn clockwise to activate goggles and IR source.

Table 2-1. Goggles Controls and Indicators Continued.

CONTROLS AND INDICATORS	FUNCTIONS
Low Battery Indicator	When blinking (right eyepiece) it indicates a low battery condition with less than 30 minutes of battery life remaining.
IR source On Indicator	When illuminated (left eyepiece) it indicates that the IR source is ON.
Objective Focus	Focuses objective lens. Adjusts for sharpest image of viewed object.
Diopter Adjustment	Focuses eyepiece lens for each eye without the need for glasses. Adjust for sharpest image of intensifier screen.
Interpupillary Adjustment	Adjusts for distance between eyes by sliding the eyepieces either together or apart so each eye can observe the entire field at the same time.

CONTROLS AND INDICATORS	FUNCTIONS
Eye Relief Adjustment	Adjusts the distance between your eyes and the goggles.
Latch	Latch used for separation of goggles, from headmount/helmet mount .
Battery Polarity Indicators	This feature, molded into the goggles, shows the proper orientation of the AA and BA-5567/U batteries.
IR Spot/Flood Lens	Focuses the IR source for a narrow beam (spot) or wide angle (flood) beam illumination.
Compass Illumination Button	Pressing this button activates the compass illumination LED which makes the compass readings visible in the goggles viewing area. Greater pressure will make the image brighter. The image disappears when the button is released.

Table 2-1. Goggle Controls and Indicators - Continued.

Section II. Preventive Maintenance Checks and Services (PMCS)

2-2 PREVENTIVE MAINTENANCE CHECKS AND SERVICES TABLE

NOTE

The unit maintenance tracks the system for when the 180 day service is due or any maintenance that is performed by either hard copy or automated. If using an automated system such as Standard Army Maintenance System (SAMS) or Unit Level Logistics System (ULLS), use the equivalent electronic form, to track using the same procedure as for the hard copy DA Form 2404, 2407 or DD Form 314 etc.

a. General. To ensure the readiness of the goggles, perform the preventive maintenance procedures in accordance with Table 2-2, prior to each mission. Preventive maintenance procedures include inspection, cleaning, and performance of the checkout procedures.

b. Warnings and Cautions. Always observe the WARNINGS and CAUTIONS appearing in the table. Warnings and cautions appear before applicable procedures. You must observe the warnings and cautions to prevent serious injury to yourself and others, or to prevent your equipment from being damaged.

NAVY USERS. Refer to Maintenance Index Page (MIP) 7621/001 and Maintenance Requirement Cards (MRCs) GFEK N and GFEL N for PMS requirements.

c. Explanation of Table Entries.

(1) Item Number Column. Numbers in this column are for reference. When completing Equipment Inspection and Maintenance Worksheet, include the item number for the check/service indicating a fault. Item numbers also appear in the order that you must do checks and services for the intervals listed.

(2) Interval Column. This column tells you when you must do the procedure in the procedure column. BEFORE procedures must be done before you operate or use the equipment for its intended mission. DURING procedures must be done during the time you are operating the equipment for its intended mission. AFTER procedures must be done immediately after you have operated or used the equipment.

(3) Location, Check/Service Column. This column provides the location and the item to be checked or serviced. The item location is underlined.

(4) Procedure Column. This column gives the procedure you must do to check or service the item listed in the Check/Service column to know if the equipment is ready or available for its intended mission or for operation. You must do the procedure at the time stated in the interval column.

(5) Not Fully Mission Capable If: Column. Information in this column tells you what faults will keep your equipment from being capable of performing its primary mission. If you make check and service procedures that show faults listed in this column, do not operate the equipment. Follow standard operating procedures for maintaining the equipment or reporting equipment failure.

Damaged accessory items (compass, IR Spot/Flood lens, sacrificial window, demist shields) do not cause the entire end item to be "not fully mission capable". However, the damaged item should be replaced as soon as practical to restore full capability of the NVG.

d. Other Table Entries. Be sure to observe all special information and notes that appear in your table.

		Location		
ltem No.	Interval	Check/ Service	Procedure	Not Fully Mission Capable If:
1.	Before	Maintenance Forms and Records	Open carrying case, inventory items and check for: • Previously recorded faults on maintenance records, DA Form 2404.	Fault not corrected.
		<u>GOGGLES</u>		
2.	Before/ After	Optical Surfaces	Inspect all lenses (objective, eyepiece, IR lens and highlight cutoff window) for dirt, fingerprint residue, chips, or cracks. If necessary, clean and dry lenses with water and lens tissue.	Chips or heavy scratches that hinder vision with goggles turned ON, or if cracks are present.

Continued.				
	1	Location	Barrishan	Not Fully Mission Capable If:
ltem No.	Interval	Check/ Service	Procedure	
3.	Before/ After	Wired Body Housing	Inspect external surfaces and latch for cracks or damage. Scratches and gouges are OK if operation is not affected. Inspect battery compartment. Check to make sure the battery cap and battery cap retainer is present. Remove battery cap and inspect for moisture, cracks, corroded or defective spring contacts, and o-ring present in cap.	Cracks or dam- age in the wired body housing. Cap is missing, contacts damaged, or corroded, o-ring is missing.

	I	Location	Procedure	Not Fully
ltem No.	Interv al	Check/ Service		Mission Capable If:
3. Cont.	Before/ After	Wired Body Housing Cont.	Remove any batteries and turn the power switch from RESET/OFF to ON to IR/PULL. Each position should have a definite stopping point. Inspect for broken or missing knob.	Power switch has no definite stopping points or knob is bro- ken or missing.
			Install batteries per paragraph 2-6 and check IR source (and momentary IR source, if so equipped) functions by following the operating instructions in paragraph 2-25.	IR source does not work, or it works and the red light does not appear in the left eyepiece.
			Check the highlight cutoff with day- light or bright room light (not fluores- scent light) by placing the objective lens cap on the objective lens. Turn the goggles ON and observe that the sys- tem cuts off within 70 \pm 30 seconds.	If damaged, refer to higher level of maintenance.

Continued.				
	1	Location	Durandura	Not Fully Mission Capable If:
ltem No.	Interval	Check/ Service	Procedure	
3. Cont.	Before/ After	Wired Body Housing Cont.	Turn goggles OFF and then ON to reenergize goggles.	
			NOTE	
			If the goggles fail this high- light cutoff test, it does not cause the end item to be non- mission capable. However, it should be sent to higher level of maintenance as soon as practical.	
4.	Before/ After	Rear Cover	Inspect external surfaces for cracks or damage. Scratches and gouges are okay if operation is not affected.	

		Location	- -	Not Fully Mission Capable If:
Item No.	Interval	Check/ Service	Procedure	
4. Cont.	Before/ After	Rear Cover Cont.	Rotate diopter adjustment to make sure the eyepiece lenses move freely and are not loose. Range is approximately ½ turn.	Binding, not moving freely or too loose.
			Check diopter cell retainers for chips.	Retainers will not hold eye- cup securely.
			Check interpupillary adjustment by sliding each eyepiece lens back and forth for binding or looseness.	Not achieving or maintaining interpupillary
			NOTE	adjustment.
			There is a certain amount of friction present to keep the eyepiece lenses from moving once you set them. This is okay.	

 Table 2-2. Preventive Maintenance Checks and Services for the NVG -Continued.

Continued.				
		Location	_	Not Fully Mission Capable If:
ltem No.	Interval	Check/ Service	Procedure	
5.	Before/ After	Eyecups	Inspect for dirt, dust, cracked or torn eyecups. Inspect for bent, broken, or improperly fitting eyecups. If necessary, clean with water.	Chips and cracks are permitted on the eyecup retain- ing rings as long as they do not interfere with in- stallation of eye- cup.
6.	Before/ After	Objective Lens	Rotate focus adjustment to ensure free movement (range is approximately 1/3 turn). Check objective lens for chips, cracks and dents.	Focus adjust- ment is binding or not able to move.

	Location Breadure	Danas kara	Not Fully	
Item No.	Interval	Check/ Service	Procedure	Mission Capable If:
6. Cont.	Before/ After	Objective Lens Cont.		Chips, cracks, or dents prevent full field-of-view, installation of LIF or the ability to focus.
7.	Before/ After	Neck Cord and Objective Lens Cap	Check the infinity focus locking ring for tightness. Check for cracks. Inspect for cracked, torn, or missing objective lens cap. Inspect neck cord for cut, damage, or loose ends. Re-tie ends if necessary.	Cracked or loose. Damaged.

 Table 2-2. Preventive Maintenance Checks and Services for the NVG -Continued.

		Location		Not Fully Mission Capable If:
ltem No.	Interval	Check/ Service	Procedure	
			NOTE	
			Operator may use the TS-4348/UV to check resolution (paragraph 2-3).	
8.	Before/ After	Viewed Image	Refer to paragraph 2-4 to inspect for operational defects.	Flickering, flashing, edge glow, or shading
			NOTE	is observed.
			If any of the following items are damaged it does not cause the entire end item to be "not fully mission capable". However, the damaged item should be re- placed as soon as practical to restore full capability of the system.	

		Location		Not Fully
Item No.	Interval	Check/ Service	Procedure	Mission Capable If:
		HEADMOUNT		
9.	Before/ After	Straps/Pads	Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.	Damage causes straps or pads to be unservice- able.
10.	Before/ After	Socket	Inspect for dirt, dust, or corrosion. Insert goggles latch into socket to verify secure attachment of goggles to headmount. If necessary, clean socket with water.	Damaged latch won't lock or is too loose.
11.	Before/ After	Eye Relief Adjustment	Press the eye relief adjustment and check for free motion. Inspect for damage.	Binding, damaged or non-operational slide mechanism.

 Table 2-2. Preventive Maintenance Checks and Services for the NVG -Continued.

Table 2-2. Preventive Maintenance Checks and Services for the NVG - Continued.				
ltem No.	Interval	Location		Not Fully Mission Capable If:
		Check/ Service	Procedure	
		HELMET MOUNT		
12.	Before/ After	Straps	Inspect for cuts, tears, fraying, holes, cracks, or defective fasteners.	Damage causes straps to be unserviceable.
13.	Before/ After	Socket	Inspect for dirt, dust, or corrosion. Insert goggles latch into socket to verify secure attachment of goggles to helmet mount. If necessary, clean socket with water.	Damaged latch won't lock or is too loose.
14.	Before/ After	Fore-and-Aft Adjustment	Press the 2 side buttons on plastic mount or depress side lever on metal mount and check for free motion. Inspect for damage.	Binding, damaged or non-operational slide mechanism.

ltem No.	Interval	Location	Descelare	Not Fully Mission Capable If:
		Check/ Service	Procedure	
		ACCESSORIES		
15.	Before/ After	Demist Shields	CAUTION The coating on the demist shield can be damaged if cleaned while wet or if cleaned with wet lens paper. Clean only when the demist shield is dry and only with dry paper. Inspect for dirt, dust, scratches or damage. If necessary, clean when shields are dry and with dry lens tissue only.	Damage or scratches hinder vision with goggles ON.

Continued.				
ltem No.	Interval	Location	Decodure	Not Fully Mission Capable If:
		Check/ Service	Procedure	
16.	Before/ After	LIF	Inspect for dirt, dust, scratches or damage. If necessary, clean with water and dry with lens tissue per paragraph 3-2.	Damage or scratches hinder vision with goggles ON.
17.	Before/ After	Sacrificial Window	Inspect for dirt, dust, scratches or damage. If necessary, clean with water and dry with lens tissue per paragraph 3-2.	Damage or scratches hinder vision with goggles ON.
18.	Before/ After	IR Spot/Flood Lens	Rotate IR Spot/Flood lens to ensure free movement.	Not free moving.
19.	Before/ After	Compass	Inspect for dirt, dust, scratches, or damage. If necessary, clean with water and dry with lens tissue.	Damaged or compass is not visible.

ltem No.	Interval	Location		Not Fully Mission Capable If:
		Check/ Service	Procedure	
19. Cont.	Before/ After	Compass Cont.	Install compass and turn on goggles. When the illumination button is depressed, compass should be visible.	
		CARRYING CASE		
20.	Before/ After	Case	Remove all items and shake out loose dirt or foreign material. Inspect for tears, cuts, excess wear, or damage to mounting clips.	
21.	Before/ After	Shoulder Strap	Inspect for cuts, tears, or excess wear or damaged clips.	
	During	None		

 Table 2-2. Preventive Maintenance Checks and Services for the NVG -Continued.

2-3 RESOLUTION CHECK USING THE TS-4348/UV TEST SET

NOTE

• The TS-4348/UV test set can be used by the operator or unit maintenance to check the resolution of an NVG at any time.

NOTE

• The TS-4348/UV test set can be used by Direct Support/Intermediate Level to perform the resolution testing 180 Day Service. If a system fails it must be tested on the TS-3895A/UV Test Set.

NOTE

Verify the resolution of the goggles using the TS-4348/UV test set at every opportunity. The resolution cannot be accurately measured without the test set.

The following procedures are designed to check the performance of the image intensifier.

a. Setup. Before using the TS-4348/UV test set, refer to TM 11-5855-299-12&P to set up and familiarize yourself with its operation and the warnings and cautions associated with that test equipment.

- The resolution test must be performed in a darkened area. Your eyes must be darkadapted to perform the test. Review the following test procedure before entering the dark area.
- Expect cosmetic blemishes, such as chicken wire, black spots, and fixed-pattern noise, to stand out while viewing through the TS-4348/UV test set when it is on the highlight level. This is acceptable.

b. Low Light and Highlight Resolution Test Procedure.

Test the goggles for low light and highlight resolution performance according to the following steps.

(1) Place the HIGH/LOW switch on the test set to the LOW position.

(2) Install the LIF per paragraph 2-11.

 $\ensuremath{(3)}$ Turn OFF the room light and let your eyes adjust to the dark.

(4) Turn ON the test set by setting the "II/OFF/III" switch to the "III" position.

(5) Turn ON the goggles and insert it into the test port on the test set.

(6) Look through the goggles and view the projected pattern (see Figure 2-2). If necessary, focus the eyepiece lenses and then the objective lens to obtain the sharpest image.

(7) The goggles must be able to resolve Group 2, Element 2, under low light conditions to pass the test. If the goggles do not pass the test, return it to maintenance for repair.

ARMY ONLY – The operator must document resolution failures on the maintenance record.

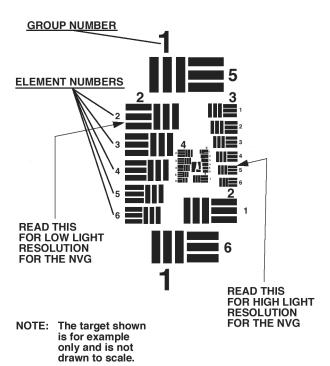


Figure 2-2. TS-4348/UV Test Set Pattern.

NOTE

For a pattern to be resolvable, three vertical bars and three horizontal bars must be visible.

(8) Flip the HIGH/LOW switch to the HIGH position.

(9) Again, look through the goggles and view the projected pattern (see Figure 2-2). If necessary, refocus the objective lens and then the eyepiece lenses to obtain the sharpest image.

(10) The NVG must be able to resolve Group 3, Element 5, under highlight conditions to pass the test. If the goggles do not pass the test, send it to a higher level of maintenance for repair.

NOTE

When using the TS-4348/UV test set, you are not viewing the entire image intensifier. Therefore, operational and cosmetic inspections must be done without the test set as specified in paragraph 2-4.

(11) Look for flashing, flickering, or other nonstable behavior of the image intensifier. Also check the image intensifier for other operational defects described in paragraph 2-4. To view the image intensifier under low light conditions, flip the HIGH/LOW switch to the LOW position and allow your eyes to become accustomed to the dark. If any unacceptable conditions are noted, return the goggles to maintenance.

2-4 INSPECTION CRITERIA FOR PROPER IMAGE INTENSIFIER OPERATION

a. General. As directed in the Preventive Maintenance Checks and Services table, image intensifier operation must be checked before each mission. This section provides information for the operator concerning what to look for, how to look for it, and how to determine if the NVG should be returned to the maintainer. The operator (Army only) must record all conditions on the appropriate maintenance forms and describe the specific defects and sign it so the maintainer can take corrective action.

CAUTION

Perform the following inspection in the dark.

To perform this inspection, attach the goggles to the headmount or helmet mount as described in paragraph 2-21 or 2-22 and turn the power switch to the ON position. Look through the goggles and view the image.

There are two groups of "defects" you may encounter - operational defects and cosmetic blemishes. Operational defects are an immediate cause to reject the NVG. Cosmetic blemishes are not a cause for rejection unless they become severe enough to interfere with the ability to perform the mission. The rejection of any NVG for cosmetic defects must be based on an outdoor evaluation and not the TS-4348/UV test set.

b. Operational Defects. These defects relate to the reliability of the image intensifier and are an indication of instability. If identified, they are an immediate cause for rejecting the NVG. They include shading, edge glow, flashing, flickering, and intermittent operation.

(1) Shading. If shading is present, you will not see a fully circular image (see Figure 2-3). Shading is very dark and you cannot see an image through it. Shading always begins on the edge and migrates inward eventually across the entire image area. Shading is a high contrast area with a distinct line of demarcation. Return the NVG to the maintainer.

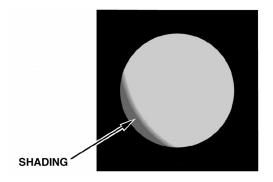


Figure 2-3. Shading.

NOTE

Make sure the shading is not the result of improper eye-relief adjustment (refer to paragraph 2-22).

(2) Edge Glow. Edge glow is a bright area (sometimes sparkling) in the outer portion of the viewing area (see Figure 2-4). To check for edge glow, block out all light by cupping a hand over the objective lens. If the image intensifier is displaying edge glow the bright area will still show up. Return the NVG to the maintainer.

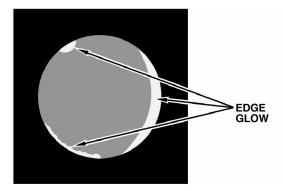


Figure 2-4. Edge Glow.

(3) Flashing, Flickering, or Intermittent Operation. The image may appear to flicker or flash. If there is more than one flicker, check for loose battery cap or weak battery. If weak or loose batteries are not the problem return the NVG to the maintainer.

c. Cosmetic Blemishes. These are usually the result of manufacturing imperfections that do not affect image intensifier reliability and are not normally a cause for rejecting a NVG. However, some types of blemishes can get worse over time and interfere with the ability to perform the mission. If you believe a blemish is cause for rejection, record the specific nature of the problem on the maintenance forms and identify the position of the blemish by using the clock method and approximate distance from the center (e.g., 5 o'clock toward the outside, 2:30 near the center, or 1:00 midway). The following are cosmetic blemishes:

(1) Bright Spots. A bright spot is a small, nonuniform, bright area that may flicker or appear constant (Figure 2-5). Not all bright spots make the NVG rejectable. Cup your hands over the objective lens to block out all light. If the bright spot remains, return the NVG to the maintainer. Bright spots usually go away when the light is blocked out. Make sure any bright spot is not simply a bright area in the scene you are viewing. **Bright spots are acceptable if they do not interfere with the operator's ability to view the image or to perform the mission.**

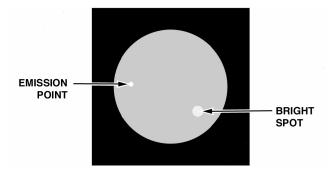


Figure 2-5. Bright Spots and Emission Points.

(2) Emission Points. A steady or fluctuating pinpoint of bright light in the image area that does not go away when all light is blocked from the objective lens (Figure 2-5). The position of an emission point within the image area does not move. Not all emission points make the NVG rejectable. Make sure any emission point is not simply a point light source in the scene you are viewing. Emission points are acceptable if they do not interfere with the operator's ability to view the image or to perform the mission.

(3) Black Spots. These are cosmetic blemishes in the image intensifier or dirt or debris between the lenses. Black spots are acceptable as long as they do not interfere with viewing the image. No action is required if this condition is present unless the spots interfere with the operator's ability to view the image or to perform the mission.

(4) Fixed-Pattern Noise. This is usually a cosmetic blemish characterized by a faint hexagonal (honeycomb) pattern throughout the viewing area that most often occurs at highlight levels or when viewing very bright lights (see Figure 2-6). This pattern can be seen in every image intensifier if the light level is high enough. This condition is acceptable as long as the pattern does not interfere with the operator's ability to view the image or to perform the mission.

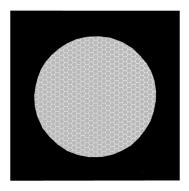


Figure 2-6. Fixed Pattern Noise.

(5) Chicken Wire. An irregular pattern of dark thin lines in the field-of-view either throughout the image area or in parts of the image area (see Figure 2-7). Under the worst case condition, these lines will form hexagonal or square-wave shaped lines. No action is required if this condition is present unless it interferes with the operator's ability to view the image or to perform the mission.

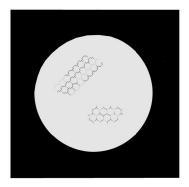


Figure 2-7. Chicken Wire.

Section III. Assembly and Preparation for Use

This chapter contains the information necessary to prepare the goggles for operation. This includes unpacking (2-5), battery installation (2-6), eyecups installation (2-7), demist shields installation (2-8), sacrificial window installation (2-9), compass installation (2-10) LIF installation (2-11), IR Spot/Flood lens installation (2-12) headmount installation and adjustment (2-13), headmount installation with protective mask (2-14), headmount with helmet installation (2-15), original helmet mount to helmet installation (2-16) new helmet mount to helmet installation (2-17) new helmet mount with new nape strap to helmet installation (2-18), AN/PVS-7D helmet mount to helmet installation (2-19) and 3X magnifier installation (2-20).

2-5 UNPACKING

The following steps must be accomplished prior to each mission where the goggles are used.

CAUTION

Before releasing latches on the old shipping and storage case, relieve air pressure inside shipping and storage case by pressing relief valve button located near the case handle.

(1) Release the two latches securing top of shipping and storage case and open.

(2) Check contents for completeness (see Figure 1-1).

(3) Remove carrying case. Open carrying case (Figure 1-1), remove goggles, and check contents for completeness. (4) Inspect the goggles for obvious evidence of damage to optical surfaces, body, eyecups, power switch, battery cap, etc. Ensure that all optical surfaces are clean and ready for use. Clean with lens paper.

2-6 INSTALLATION OF BATTERIES

CAUTION

To protect the image intensifier, keep the objective lens cap on when the monocular is not in use or when using the NVG in daylight conditions.

The NVG will operate with any of the battery types identified in Table 2-3. Batteries are not supplied with the NVG and must be obtained separately.

BATTERY TYPE	NEGLIGIBLE IR SOURCE USAGE	IR SOURCE USAGE 10% OF THE TIME
BA-5567/U (Lithium)	22 Hrs.	20 Hrs.
AA Alkaline	60 Hrs.	55 Hrs.
AA Lithium L91	70 Hrs.	65 Hrs.

Table 2-3. Estimated Battery Life.

NOTE

The battery data in Table 2-3 represents operation under room temperature. When operating under cooler conditions, battery life will decrease.

CAUTION

- Do not mix battery types (i.e., Alkaline and Lithium).
- Make certain the power switch is in the OFF position before installing batteries.

Install either two AA batteries or one BA-5567/U lithium battery as follows. Do not mix battery types.

(1) Remove the battery cap by turning it counterclockwise.

(2) Check to ensure the o-ring is present. Replace if missing.

(3) Observe polarity, as indicated on the outside of the battery compartment, and insert either two AA 1.5-volt batteries or one 3.0-volt BA-5567/U battery into battery compartment, plus (+) end first (Figure 2-8).

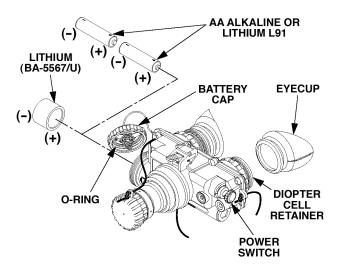


Figure 2-8. Battery and Eyecup Installation.

(4) Replace battery cap by pushing and turning it clockwise. Tighten it firmly to ensure a watertight seal.

2-7 INSTALLATION OF EYECUPS

Install eyecups as follows: Refer to Figure 2-8.

(1) Carefully press each eyecup over the diopter cell retainer.

(2) Rotate each eyecup into proper viewing position. Adjust for best eye fit. The eyecups must seal around your eyes to prevent the green glow from escaping.

2-8 INSTALLATION OF DEMIST SHIELDS

Install the demist shields as follows: Refer to Figure 1-2.

CAUTION

If the demist shields need to be cleaned, make sure they are dry and use dry lens paper to clean. If the demist shields are wiped while wet or with wet lens paper, you will damage the coating.

NOTE

If inclement operating conditions are expected (e.g. significant temperature change and high humidity), install demist shields to minimize eyepiece lens fog prior to mission.

(1) Carefully remove eyecups.

(2) Carefully press a demist shield onto each eyepiece. Be careful not to smudge the eyepieces or demist shields.

(3) Install the eyecups per paragraph 2-7.

2-9 INSTALLATION OF SACRIFICIAL WINDOW

Install the sacrificial window as follows: Refer to Figure 1-2.

CAUTION

If adverse operating conditions (dust or sand), are expected, attach the sacrificial window to protect the objective lens from scratches or other damage.

(1) If the compass or objective lens cap is in place, remove it.

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(2) Carefully push the sacrificial window onto the objective lens until it stops. Turn the sacrificial window clockwise until it snaps into place.

2-10 INSTALLATION OF COMPASS

CAUTION

- Use of the compass with the plastic headmount or the plastic helmet mount will result in inaccurate compass readings. The magnet cannot be removed from these mounts.
- The magnet must be removed from the ruggedized metal helmet mount before installation of the compass. Failure to do so will result in inaccurate compass readings.
- If the magnet is not removed, turn the ruggedized metal helmet mount in to unit maintenance for removal. See Figure 2-9 for location of magnet.

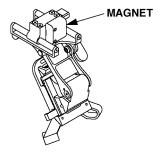


Figure 2-9. Locating the Magnet.

NOTE

- Prepare the goggles for operation.
- Leave LIF in place when installing the compass.
- The tethering cord can be used to tether the compass to your person to prevent losing the compass if it is dropped. To use the tethering cord, tie the end without the clip tightly around the compass and attach the clip to a buttonhole, belt loop or other convenient point.

(1) If the sacrificial window or objective lens cap is in place, remove it.

(2) Turn goggles ON.

(3) Rotate the objective lens focus completely counterclockwise (while looking through the goggles).

NOTE

The o-ring must be in place in the compass in order for the compass to fit properly.

(4) Press the compass onto the objective lens at an angle using your left hand. Slowly turn the compass counterclockwise until it is the vertical position (with compass illumination button pointing down). See Figure 2-10.

(5) Ensure that the compass fits tightly.

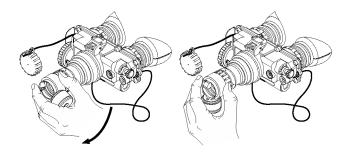


Figure 2-10. Compass Installation.

(6) Refer to paragraph 2-24 for operation of the compass.

2-11 INSTALLATION OF LIF

Install the LIF as follows:

(1) Remove the container/wrench from the carrying case (Figure 1-1).

CAUTION

Be careful not to touch glass surfaces. If you get fingerprints or contamination on glass surfaces, use lens paper to clean the LIF. If moisture is needed, use your breath to mist the surface of the glass.

(2) If the objective lens cap, compass, or sacrificial window is on the objective lens, remove it.

(3) Carefully open the container/wrench and remove the LIF. Refer to Figure 2-11.

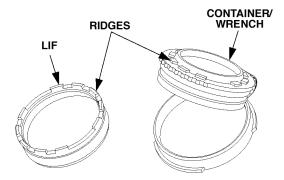


Figure 2-11. LIF.

(4) Hold the LIF by the ridged end (see Figure 2-11) and thread it clockwise, into the objective lens.

CAUTION

Do not overtighten the LIF into the objective lens.

(5) Using the ridged side of the container/wrench as a wrench, engage the ridges on the container with the ridges on the LIF and tighten the LIF hand tight.

(6) Place the empty container/wrench back into the carrying case.

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NOTE

- The objective lens cap, compass, or the sacrificial window will fit onto the end of the objective lens with the LIF in place. On some systems when the LIF is installed, the objective lens cap or the sacrificial window will not fit on the objective lens as completely as on other systems.
- The LIF must be used at all times unless directed by the unit commander to remove the LIF, based upon his/her assessment of the laser threat in the theater of operations. Use of this filter will result in a slight reduction in system gain.

(7) Install the objective lens cap or the sacrificial window over the LIF.

2-12 INSTALLATION OF IR SPOT/FLOOD LENS

Press the IR spot/flood lens over the IR source window until it is tight against the goggles. Refer to Figure 2-12.

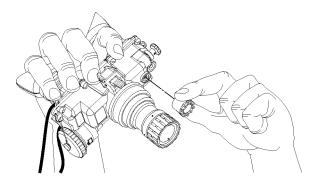


Figure 2-12. IR Spot/Flood Lens Installation.

2-13 INSTALLATION AND ADJUSTMENT OF HEADMOUNT

Don the headmount as follows:

NOTE

Do not don the headmount while the goggles are attached.

(1) Prior to donning the headmount, loosen the four ends of the chinstrap approximately two inches from the sliding bar buckles (Figure 2-13).

(2) Snap the front (Figure 2-13), and rear snaps in place.

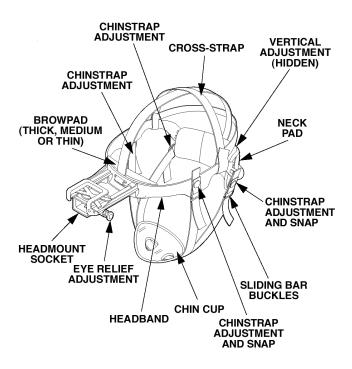


Figure 2-13. NVG Headmount Adjustments.

NOTE

If the headmount is too loose, remove the attached thin browpad (Figure 2-13) and replace with either the medium or thick browpad stored in the carrying case. Refer to paragraph 3-3(1) for removal and replacement of the browpads.

(3) With both hands, grasp the neck pad (Figure 2-13) and pull the harness over your head and the neck pad down to the back of your neck.

(4) Holding the chin cup in position on chin, adjust both sides of the chinstrap until you feel light pressure against your chin. (DO NOT TIGHTEN.)

(5) Maintain the position of the chin cup and remove any slack from the front and rear chinstraps. (DO NOT TIGHTEN.)

(6) Ensure that the cross-strap is not twisted and remove slack by adjusting the vertical adjustment at the neck pad.

(7) Adjust chinstrap and vertical adjustment until the chin cup and headmount are in a comfortable but firm position.

NOTE

After installing the goggles, minor strap adjustments may be necessary to achieve comfort.

(8) Refer to paragraph 2-21 for operating procedures.

2-14 INSTALLATION OF HEADMOUNT WITH PROTECTIVE MASK

(1) Place protective mask on your head per the instructions provided with the protective mask.

WARNING

When installing the headmount over the protective mask, be careful not to break the protective mask seal around your face.

(2) Install the headmount per the instructions in paragraph 2-13.

NOTE

It may be necessary to remove the browpad (Figure 2-13) when wearing the headmount over a protective mask.

2-15 INSTALLATION OF HEADMOUNT WITH HELMET

Install the headmount per the instructions in paragraph 2-13. The helmet is worn over the headmount.

2-16 INSTALLATION OF ORIGINAL HELMET MOUNT TO HELMET

(1) Remove helmet mount (Figure 1-3) from the carrying case. Refer to Figure 2-14 for the helmet mount features.

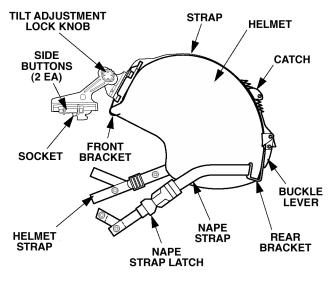


Figure 2-14. Helmet Mount Features.

(2) Ensure that the strap is adjusted so that the "M" marking is aligned with the top of the helmet mount block (See Figure 2-15.)

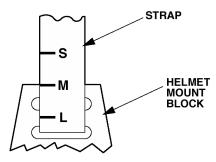


Figure 2-15. Helmet Strap Size Adjustment.

(3) With catch in forward most position, place the strap over the top of the helmet, center and hook the rear bracket onto the rear of the helmet. Center the front bracket, hook it on the front of the helmet and hold it in place. (See Figure 2-14.)

(4) With the buckle lever open, take up the slack in the strap using catch. Close the buckle lever. (See Figure 2-16.)

(5) Place helmet upside down with helmet mount facing you.

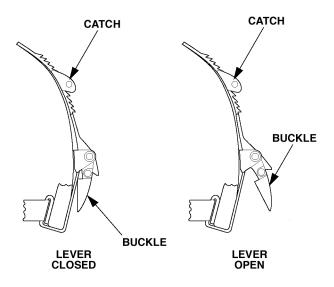


Figure 2-16. Buckle and Catch.

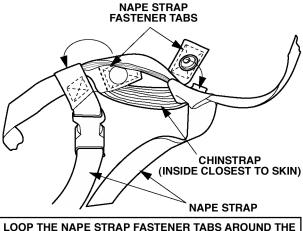
NOTE

Steps 6 and 7 describe the installation of the nape strap to the chinstrap. To accomplish these steps, it may be necessary to unthread the chinstrap from the helmet.

(6) Thread chinstrap through right end of nape strap and snap nape strap fastener tab closed (refer to Figure 2-17).

(7) Thread chinstrap through left end of nape strap and snap nape strap fastener tab closed (refer to Figure 2-17).

(8) Disengage the nape strap latch on left side of nape strap.



LOOP THE NAPE STRAP FASTENER TABS AROUND THE CORNERS OF THE CHINSTRAP AND SNAP CLOSED. AFTER CLOSURE, THE SNAPS WILL BE ON THE OUTSIDE, AWAY FROM YOUR CHIN.

Figure 2-17. Nape Strap Installation.

(9) Don the helmet.

(10) Engage the nape strap at the nape strap latch. Tension the chinstrap and nape strap for a secure and stable fit. The brow of the helmet should be parallel with the ground.

2-17 INSTALLATION OF NEW HELMET MOUNT TO HELMET

(1) Remove the helmet mount (Figure 1-3) from the carrying case. Make sure the helmet mount is complete. Refer to Figure 2-18 for the helmet mount components and features.

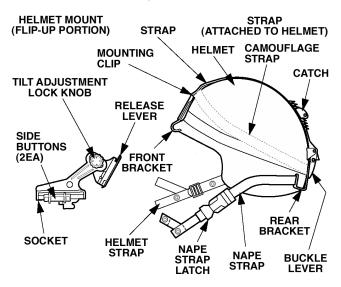


Figure 2-18. Helmet Mount Components and Features.

CAUTION

To prevent possible equipment damage, remove both the goggles and the helmet mount from the helmet when not required for immediate use. The strap can remain in place on the helmet.

(2) If the helmet mount and strap are connected, remove the helmet mount. To do this, push the release lever at the top center of the helmet mount and slide the two assemblies apart.

(3) The strap attaches to the helmet the same as the original helmet mount. Perform steps in paragraph 2-16 to install the strap.

NOTE

The strap is now properly attached to the helmet.

(4) If the helmet has its cloth cover and camouflage strap installed, it will be necessary to slide the camouflage strap up (at about a $30^{\circ} - 45^{\circ}$ angle) at the front of the helmet (see Figure 2-18).

This step is required in order to prevent the helmet mount from catching on the camouflage strap when the helmet mount is installed on the strap.

(5) To install the helmet mount into the strap, place it over the top of the mounting clip and slide it down until it locks into place with a click (see Figure 2-19).

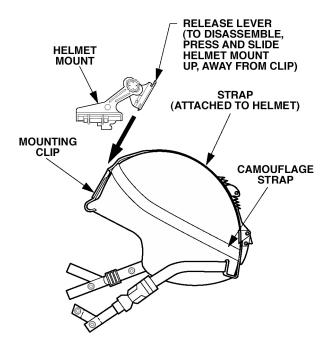


Figure 2-19. Attaching the Helmet Mount to the Strap.

2-18 INSTALLATION OF NEW HELMET MOUNT WITH NEW NAPE STRAP TO HELMET

(1) Remove the helmet mount (Figure 1-3) from the carrying case. Make sure the helmet mount is complete. Refer to Figure 2-20 for the helmet mount components and features.

CAUTION

To prevent possible equipment damage, remove both the goggles and the helmet mount from the helmet when not required for immediate use. The strap can remain in place on the helmet.

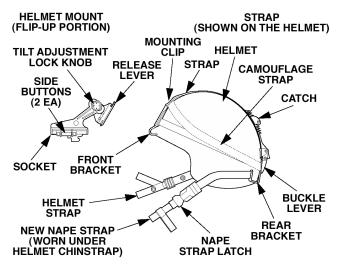


Figure 2-20. Helmet Mount Features (New Nape Strap).

(2) If the helmet mount and strap are connected, remove the helmet mount. To do this, push the release lever at the top center of the helmet mount and slide the two assemblies apart.

(3) Adjust the strap to fit the helmet size being used.

(4) With the catch in the most extended position, place the strap over the top of the helmet, center and hook the rear bracket onto the rear of the helmet. Center the front bracket hook on the front of the helmet and hold it in place (see Figure 2-21).

(5) With the buckle lever open, take up the slack in the strap using catch. Close the buckle lever (see Figure 2-16).

(6) If the helmet has its cloth cover and camouflage strap installed, it will be necessary to slide the camouflage strap up (at about a $30^{\circ} - 45^{\circ}$ angle) at the front of the helmet (see Figure 2-21).

This step is required in order to prevent the helmet mount from catching on the camouflage strap when the helmet mount is installed on the strap.

(7) Disengage the nape strap latch on left side of nape strap.

(8) Don the helmet. Do not fasten the helmet chinstrap.

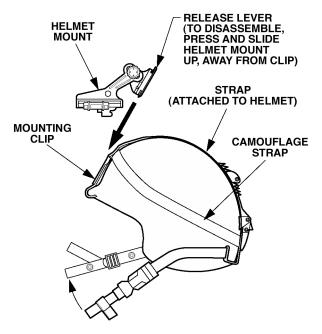


Figure 2-21. Attaching Helmet Mount to Strap (New Nape Strap).

(9) Engage the nape strap at the nape strap latch. Tension the nape strap for a stable fit, then install and tension the helmet chinstrap. The brow of the helmet should be parallel to the ground and the helmet stable on the head.

(10) To install the helmet mount into the strap, place it over the top of the mounting clip and slide it down until it locks into place with a click (see Figure 2-21).

2-19 INSTALLATION OF AN/PVS-7D HELMET MOUNT TO HELMET

a. Using Helmet Mount Strap.

(1) Remove the helmet mount (Figure 1-3) from the carrying case. Refer to Figure 2-22 for helmet mount features.

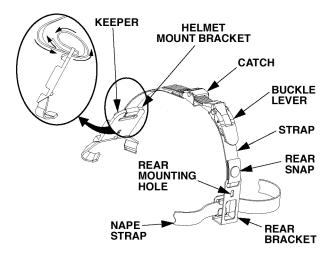


Figure 2-22. Installation of Helmet Mount.

(2) Press the release button (Figure 2-23) to remove the mount from the helmet mount bracket.

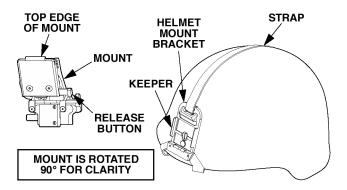


Figure 2-23. Helmet Mount.

(3) Make sure the strap is laced onto the helmet mount bracket as shown in Figure 2-22.

(4) With catch (see Figure 2-22) in forward most position, place the strap over the top of the helmet center (see Figure 2-23).

(5) Hook the rear bracket on the center of the back of the helmet and lay the strap with helmet mount bracket over the top of helmet.

(6) Hook the helmet mount bracket in the center of the front lip of the helmet and hold it in place.

(7) With the buckle lever open, take up the slack in the strap using the catch. Close the buckle lever.

(8) Disengage the nape strap latch on left side of nape strap.

(9) Don the helmet. Do not fasten the helmet chinstrap.

(10) Engage the nape strap at the nape strap latch. Tension the nape strap for a stable fit, then install and tension the helmet chinstrap. The brow of the helmet should be parallel to the ground and the helmet stable on the head.

(11) Insert the top edge of the mount under the keeper on the helmet mount bracket and rotate downward until the latch engages. (See Figure 2-24) To release the mount from the helmet bracket, press the release button (see Figure 2-23) and pull forward and down.

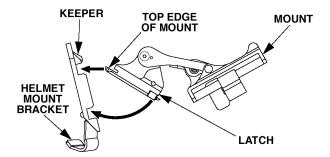


Figure 2-24. Installation of Helmet Mount.

b. MARINE CORPS ONLY – Using Existing Helmet Screw (no strap).

NOTE

Refer to Figures 2-24 and 2-25 for reference and definition of terms.

(1) Remove the helmet mount from the carrying case.

(2) Press the release button to remove the mount from the helmet mount bracket.

(3) Unthread the strap from the helmet mount bracket. Unsnap the rear snap and remove the rear mount bracket from the strap.

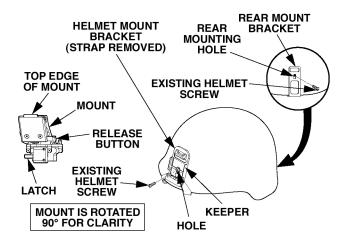


Figure 2-25. Helmet Mount.

NOTE

Place the strap in the carrying case – it is not used for this mounting method.

(4) Find the screw located in the front center of the helmet. Using a flat tip screwdriver, remove the screw. Hook the helmet mount bracket on the front of the helmet and center it over the hole where the screw was removed.

(5) Insert the screw removed in step 4 above through the hole in the helmet mount bracket and through the helmet (see Figure 2-25).

(6) Align the nut on the helmet's interior strapping to the hole and tighten the screw with a flat tip screwdriver.

(7) Attach the mount to the helmet mount bracket. Insert the top edge of the mount under the keeper on the helmet mount bracket and rotate downward until the latch engages (see Figure 2-24). To release the mount from the helmet bracket, press the release button (see Figure 2-25) and pull forward and down.

(8) Find the screw located in the lower rear, center of the helmet. Using a flat tip screwdriver, remove the screw. Hook the rear bracket on the lower rear of the helmet and center it over the hole where the screw was removed.

(9) Insert the screw removed in step 8 through the hole in the rear bracket and through the helmet.

(10) Align the nut to the hole and tighten the screw with the flat tip screwdriver.

(11) Disengage the nape strap latch on left side of nape strap.

(12) Don the helmet. Do not fasten the helmet chinstrap.

(13) Engage the nape strap at the nape strap latch. Tension the nape strap for a stable fit, then install and tension the helmet chinstrap. The brow of the helmet should be parallel to the ground and the helmet stable on the head.

(14) Insert the top edge of the mount under the keeper on the helmet mount bracket and rotate downward until the latch engages (see Figure 2-24). To release the mount from the helmet bracket, press the release button (Figure 2-25) and pull forward and down.

2-20 INSTALLATION OF 3X MAGNIFIER

The 3X magnifier can be threaded directly into the objective lens, with the LIF removed. It can also be threaded into the focus ring adapter and slipped on over the end of the objective lens with the LIF installed.

Figures 2-26 and 2-27 illustrate these installation procedures.

NOTE

The tethering cord can be used to tether the 3X magnifier to your person to prevent losing the lens if it is dropped. To use the tethering cord, tie the end without the clip tightly around the 3X magnifier and attach the clip to a button hole, belt loop or other convenient point.

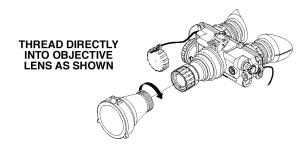


Figure 2-26. 3X Magnifier Installation without LIF

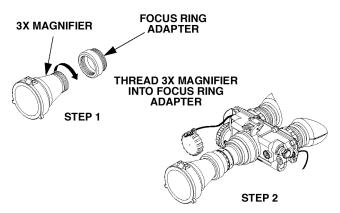


Figure 2-27. 3X Magnifier Installation with LIF in Place.

Section IV. Operating Procedures

This section contains operating procedures for using the NVG as hand-held, head mounted or helmet mounted goggles. Prior to operating the goggles, make certain that all steps in Section III, Assembly and Preparation for Use, have been read and performed.

2-21 HEAD MOUNTED OPERATION

CAUTION

Operate the goggles only under darkened conditions or use the objective lens cap to cover the objective lens for daylight conditions.

- (1) Ensure that batteries are installed per paragraph 2-6.
- (2) Don the headmount per instructions in paragraph 2-13.

NOTE

Paragraphs 2-14 and 2-15 provide additional information required when installing the headmount with a protective mask, or helmet.

NOTE

To make it easier to align the goggles, eyecups and eyepiece lenses to the eyes, depress the eye relief adjustment (Figure 2-13) and slide the headmount socket all the way forward before attaching the goggles.

(3) Align the goggles' latch (Figure 2-1) to the headmount socket (Figure 2-13). Press and hold down the latch lever while installing the goggles into the headmount socket (Figure 2-13). Release the latch (Figure 2-1) when the goggles fully engage the socket.

(4) Set your eye relief by depressing the eye relief adjustment (Figure 2-13) and move the goggles back toward your eyes until the eyecups comfortably seal around the eyes.

(5) Turn the power switch to ON.

(6) Adjust the interpupillary distance (Figure 2-1) by sliding the eyepiece lenses together or apart so each eye can observe the entire field-of-view at the same time. The eyepiece lenses adjust independently.

(7) Readjust the vertical adjustment (Figure 2-13) of the headmount until the goggles are properly aligned with your eyes.

NOTE

- The sharpest image will be observed only when the objective lens and both eyepiece lenses are properly focused.
- Fold the eyecup to obstruct your view through the eyepiece lens instead of closing one eye to prevent the eye from being temporarily out of focus.

(8) Fold the right eyecup over the eyepiece lens with your right thumb or forefinger to obstruct view through the right eyepiece lens. Rotate the left diopter adjustment for the clearest view of the image intensifier screen.

(9) Fold the left eyecup over the eyepiece lens with your left thumb or forefinger to obstruct view through the left eyepiece lens. Rotate the right diopter adjustment for the clearest view on the image intensifier screen.

NOTE

Any readjustment of eye relief requires resetting the diopter adjustments.

(10) Adjust the eye relief distance by pressing the eye relief adjustment (Figure 2-13) and sliding goggles fore or aft to obtain a full field-of-view of the image. Reset the diopter adjustments for best image.

(11) Adjust the objective lens focus ring (Figure 2-1) while observing an object until the sharpest image is obtained.

2-22 HELMET MOUNTED OPERATIONS

CAUTION

- Take some precautions when using/handling the helmet mount. Most damage occurs when the helmet mount is left on the helmet when not needed for immediate use. Observe the following cautions to significantly extend the useful life of the helmet mount.
- Damage in the field has occurred when the goggles are mounted to the helmet mount and are in the flipped up position.
- Disconnect the helmet mount from the helmet and properly stow it when not needed for immediate use.
- Do not drop or throw the helmet with the helmet mount attached to it.
- The goggle and helmet mount should not be left on the helmet when the helmet is removed.
- With the goggle in the flipped UP position, do not flick the goggle down by shaking the helmet. This places significant stress on the helmet mount or on the latch.
- When not in use, properly stow the helmet mount in the carrying case or other protected location.

NOTE

- For the three newer model helmet mounts which have a quick disconnect feature, the strap can remain in place on the helmet. However, the protruding goggle mount portion should be removed.
- The helmet mount provides two positions for the user to position the goggles. The flipped down position allows the user to position the goggles directly in front of the eyes. The helmet mount also allows the user to rotate the goggles to a flipped up position when the goggles are not needed for immediate use. Both the flipped down and the flipped up positions have a positive stop which assures the user that the goggles are in the correct position.
- Marine Corps Only If you have the newest version helmet mount which comes with the AN/PVS-7D, use the helmet screws to mount the helmet mount bracket directly to the helmet per paragraph 2-19b.
- All Other Services If you have the newest version helmet mount, return the helmet and the helmet mount to unit maintenance for direct mounting of the bracket via the helmet screws.

NOTE

Operation of the goggle is the same with any version of the helmet mount.

(1) Ensure that batteries are installed per paragraph 2-6.

(2) Don the helmet mount per paragraph 2-16 (original style), 2-17 (new style with quick disconnect), 2-18 (new quick disconnect with new nape strap) or 2-19 (AN/PVS-7D version).

(3) Place the goggles in the socket of the helmet mount. Set your eye relief by depressing the side buttons (or press down on side lever on metal mount) (see Figure 2-28) and carefully move the goggles fore or aft until the eyecups comfortably seal around the eyes. Readjust the helmet straps as required for vertical adjustment.

(4) Turn power switch to ON. Adjust the tilt by using the tilt adjustment lock knob (or tilt adjustment lever on metal mount) (Figure 2-28) until you obtain a comfortable viewing angle.

(5) Adjust the interpupillary distance (Figure 2-1) by sliding the eyepiece lenses together or apart so each eye can observe the entire field-of-view at the same time. The eyepiece lenses adjust independently. If necessary, readjust the eye relief.

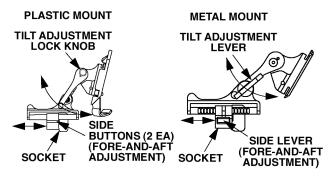


Figure 2-28. Tilt and Flip-up Mechanisms.

The sharpest image will be observed only when the objective lens and both eyepiece lenses are properly focused.

(6) Fold the right eyecup over the eyepiece lens with your right thumb or forefinger to obstruct view through the right eyepiece lens. Rotate the left diopter adjustment for the clearest view of the image intensifier screen.

(7) Fold the left eyecup over the eyepiece lens with your left thumb or forefinger to obstruct view through the left eyepiece lens. Rotate the right diopter adjustment for the clearest view on the image intensifier screen.

(8) Adjust the eye relief distance by pressing the eye relief adjustment (Figure 2-13) and sliding goggles fore or aft to obtain a full field-of-view of the image. Reset the diopter adjustments for best image.

NOTE

Any readjustment of eye relief requires resetting the diopter adjustments.

(9) Adjust the objective lens focus (Figure 2-1) while observing an object until the sharpest image is obtained.

WARNING

It is critical that the goggles be turned off manually before placing them in the flipped up position in order to avoid detection by the enemy.

(10) To flip up, turn the power switch to the RESET/OFF position, place an open hand under the goggles, grasp the goggles and rotate up and rearward until the latch is firmly engaged.

(11) To flip down, grasp the goggles and rotate down and forward until the latch is firmly engaged.

(12) Turn the power switch to the ON position to resume viewing.

2-23 HAND-HELD OPERATION

CAUTION

Operate the goggles only under darkened conditions or use the objective lens cap to cover the objective lens for daylight conditions.

NOTE

When utilizing the NVG for driving purposes, the NVG may not be used in the hand-held mode. The goggles must be worn in the headmounted or helmet mounted position.

- (1) Ensure that batteries are installed per paragraph 2-6.
- (2) Turn the power switch to ON.

(3) Adjust the interpupillary distance (Figure 2-1) by sliding the eyepiece lenses together or apart so each eye can observe the entire field-of-view at the same time. The eyepiece lenses adjust independently.

NOTE

The sharpest image will be observed only when the objective lens and both eyepiece lenses are properly focused.

(4) Hold the goggles with your left hand and fold the left eyecup over the eyepiece lens with your thumb or forefinger to obstruct view through the left eyepiece lens. Rotate the right diopter adjustment for the clearest view of the image intensifier screen. (5) Hold the goggles with your right hand and fold the right eyecup over the eyepiece lens with your right thumb or forefinger to obstruct view through the right eyepiece lens. Rotate the left diopter adjustment for the clearest view of the image intensifier screen.

(6) Readjust the objective lens while observing an object until the sharpest image is obtained.

2-24 OPERATION WITH COMPASS

CAUTION

You will get inaccurate readings when using the compass on any headmount or helmet mount with the magnet still installed. Only the magnet on the metal mount can be removed without causing damage to the equipment, see paragraph 2-10.

NOTE

- The compass reading is the magnetic North, not true North.
- The compass reading is within 2° of correct absolute magnetic bearing. Compass readings with mounted goggles (headmount or helmet mount) can be up to ±15° of correct absolute magnetic bearing. This occurs mostly in the East (90°) to West (270°) and less in the North (360°) to South (180°) reading. If the compass is inadvertently magnetized this could cause an additional 15° error.

NOTE

The objective lens focus can be fine tuned after installation, but in order to obtain an accurate reading, the compass must be vertical. (The compass image must be level.)

(1) Install compass per paragraph 2-10.

(2) If necessary to more clearly view your distant object, adjust the objective lens focus slightly by gripping the compass and turning clockwise.

WARNING

The compass illuminator can be seen by other night vision users.

CAUTION

Increase brightness slowly. Excessive brightness may burn a temporary image into the image intensifier. Do not increase brightness any more than is necessary to clearly read the compass heading.

NOTE

The monocular must be focused at or near infinity for proper compass operation.

(3) To view the compass through the goggles, grip the compass with index finger on top and thumb on illumination button at the bottom (Figure 2-1). Press button slightly with thumb until proper brightness is obtained. The image should appear as shown in Figure 2-29.

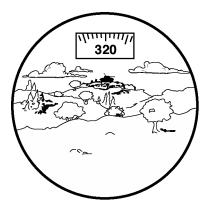


Figure 2-29. View through Installed Compass.

(4) The compass readings should change when you move your head from side to side. Rotate or tap compass slightly to ensure compass is operating correctly. Hold the goggles in a level position to assure free rotation of the compass scale.

(5) The tick mark closest to the center of the light display is the compass bearing. The tick marks are in degrees, with longer tick marks every five degrees and bearing labels every 10 degrees.

2-25 IR SOURCE OPERATIONS

WARNING

The IR source is a light that is invisible to the unaided eye for use during conditions of extreme darkness. However, the light from the IR source can be detected by the enemy using night vision devices.

CAUTION

Do not use excessive force to place the power switch into the momentary IR position.

NOTE

- The purpose of the IR source is for viewing at close distances up to 3 meters when additional illumination is needed.
- Some goggles are equipped with an additional momentary IR function. For these goggles, turn the power switch knob clockwise (without pulling) past the ON position. Observe that a red light appears in the left eyepiece.

(1) Pull the power switch knob (Figure 2-1) out and rotate clockwise to the IR position. With the goggles held to the eyes, observe that a red light appears in the left eyepiece. This indicates that the IR source is operating.

(2) Operation with IR Spot/Flood Lens:

(a) Pull the power switch knob (Figure 2-1) out and rotate clockwise to the IR position. With the goggles held to the eyes, turn the IR spot/flood lens until you have achieved the optimum illumination for the desired distance.

(b) Turn the power switch counterclockwise to the ON position. Observe that the red indicator disappears.

2-26 OPERATION WITH 3X MAGNIFIER

(1) Install 3X magnifier per paragraph 2-20.

NOTE

The mated 3X magnifier and objective lens will turn as a unit to allow focusing.

(2) Grasp the 3X magnifier and focus while observing an object until the sharpest image is obtained.

2-27 PREPARATION FOR STORAGE

(1) Shutdown. Perform the following procedures to shut down the goggles.

(a) Turn the power switch to the OFF position.

(b) Remove the goggles from the headmount or helmet mount (if so equipped) by depressing the latch lever (Figure 2-1) and removing the goggles from the headmount or helmet mount socket (Figure 2-13).

(2) Packaging After Use.

WARNING

Do not carry batteries in pockets containing metal objects such as coins, keys, etc. Metal objects can cause the batteries to short circuit and become very hot.

(a) Unscrew battery cap and remove battery(ies).

(b) Inspect the battery compartment for corrosion or moisture. Clean and dry if necessary.

(c) Replace the battery cap.

(d) Remove the demist shields, sacrificial window, compass or 3X magnifier if installed. Install objective lens cap.

- Prior to placing goggles into carrying case, ensure goggles and case are free of dirt, dust, and moisture.
- The goggles and helmet mount should not be left on the helmet when the helmet is removed.

(e) Properly position the pull tabs (carrying case pockets) by sliding your finger into each pocket to tuck each tab into place. (Old case only)

CAUTION

- Old helmet mount will not fit into the carrying case, store in the shipping and storage case.
- Put the sacrificial window in the bottom left or right corner of the carrying case accessory pocket to prevent damage to the window. (Old case only)

(f) Refer to Figure 1-1 for proper placement of demist shields, batteries, carrying case strap, lens paper, sacrificial window, manual, LIF, browpads, headmount, helmet mount and compass.

(g) Place the goggles (objective lens down) into the shallow pocket of the carrying case.

(h) Place the carrying case into the shipping and storage case; close and latch. (Figure 1-1)

(i) Return to storage area.

Section V. Operation Under Unusual Conditions

2-28 OPERATION IN DUSTY OR SANDY AREAS

CAUTION

Operation in dusty or sandy areas can pit scratch the optical elements and damage the mechanical components unless the precautions given below are observed.

(1) Ensure that the sacrificial window is in place over the LIF.

(2) Avoid pointing the goggles into the wind unless necessary for operation.

(3) Keep the carrying case closed unless removing or replacing items.

(4) Ensure that all dust and sand is removed from the goggles and carrying case after operation.

2-29 OPERATION IN RAINY OR HUMID CONDITIONS

CAUTION

Operation in rainy or humid conditions can cause corrosion and deterioration of the goggles unless the precautions given below are observed. (1) Install the demist shields per paragraph 2-8.

(2) Keep the carrying case, and the shipping and storage case closed unless removing or replacing items.

(3) Dry the goggles, mounts, and accessories after exposure to rain or high humidity and before storage. This will prevent mildew from forming in the case.

(4) Do NOT store goggles in a wet carrying case or a wet shipping and storage case.

2-30 OPERATION IN SALT WATER AREAS

(1) After exposure to salt water, clean the NVG per paragraph 3-2.

2-31 OPERATION IN NUCLEAR, BIOLOGICAL AND CHEMICAL (NBC) ENVIRONMENTS

WARNING

Do not use contaminated eyecups. They must be replaced.

(1) Decontamination – Wear a protective mask while using goggles after decontamination process.

(2) Hardness – Do not use DS-2 for decontaminating the NVG. To decontaminate, use 5% sodium hypochlorite and rinse with hot ($185^{\circ}F$) soapy water.

2-32 OPERATION IN LASER THREAT ENVIRONMENTS

NOTE

The LIF is a light protection filter. This filter must be used at all times unless directed by the unit commander, to remove the LIF based upon his/her assessment of the laser threat in the theater. Use of this filter will result in a slight reduction in system gain.

Install the LIF as described in paragraph 2-11.

CHAPTER 3 MAINTENANCE INSTRUCTIONS

Section I. Lubrication Instructions

No lubrication is required.

Section II. Troubleshooting Procedures

3-1 TROUBLESHOOTING

Table 3-1 lists common malfunctions that you may find with your equipment. Perform the test, inspections, and corrective actions in the order they appear in the table.

This table cannot list all the malfunctions that may occur, all the tests and inspections needed to find the fault, or all the corrective actions needed to correct the fault. If the equipment malfunction is not listed or actions listed do not correct the fault, notify your maintainer.

Table 3-1. Operator's Troubleshooting.

	MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1.	Goggles fail to activate.	Visual.	Turn power switch to RESET/OFF position and then ON.
		Check for defective, missing or improperly installed battery(ies).	Replace batteries or install correctly.
			If goggles still fail to activate, refer to higher level of maintenance.
2.	IR source fails to activate.	In a dark location with system turned on, activate IR source. Visually check IR source operation; scene should brighten.	If IR source still fails to activate, refer to higher level of maintenance.
3.	IR source indicator fails to activate.	Visual.	Refer to higher level of maintenance.

	MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION	
4.	Poor image quality.	Check objective lens or eyepiece lens focus.	Refocus.	
		Check for fogging or dirt on	Clean lens surfaces.	
		objective lens or eyepiece lens.	If image quality is still poor, refer to higher level of maintenance.	
5.	Light visible around eyecup.	Check eye relief distance.	Re-adjust for proper eye relief distance.	
		Check eyecup for resiliency.	If eyecups defective, refer to higher level of maintenance.	
6.	Diopter adjustment cannot be made.	Check to see if the diopter adjustment is bent or broken.	If damaged, refer to higher level of maintenance.	
7.	Interpupillary adjust- ment cannot be made (left and right eye).	Defective eyepiece lens.	Refer to higher level of maintenance.	

	MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8.	Battery cap difficult to turn.	Check for dirt or grit in threads.	Clean.
		Visually inspect for the presence of an o-ring (Figure 2-8).	If o-ring is missing, refer to higher level of maintenance.
		Check for damaged battery cap or threads on battery compartment.	If damaged, refer to higher level of maintenance.
9.	Head straps cannot be tightened.	Check for defective buckles, fasteners or straps.	If damaged, refer to higher level of maintenance.
10.	Headmount or helmet mount socket and goggle latch does not catch.	Check socket or latch for dirt.	Clean socket and latch.
		Check socket or latch for damage.	If damaged, return both headmount or helmet mount and goggles to high- er level of maintenance.

MALFUN	CTION	TEST OR INSPECTION	CORRECTIVE ACTION
11. Helmet Mount tighten to helm		Visual.	If damaged, refer to higher level of maintenance.
12. LIF will not three	ead or	Check for dirt in threads.	Clean threads.
obstruct view.	obstruct view.	Check for damaged assembly.	If damaged, refer to higher level of maintenance.
13. IR spot/flood le adjust.	ens will not	Visual.	Refer to higher level of maintenance.
14. Compass does illuminate.	s not	Visual.	Refer to higher level of maintenance.
15. Compass will r the goggles.	not stay on	Visual.	Refer to higher level of maintenance.
16. Compass disp clear.	lay is not	Visual.	Make sure the goggles are focused for infinity. If so, and compass display is still not clear, refer to higher level of maintenance.

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
17. Goggles do not cut off when exposed to highlight.	Visual. Perform the following test under daylight or bright room light (not fluorescent light). Place the objective lens cap on the objective lens. Turn goggles ON and observe that they cut off within 70 ±30 seconds after energized. Turn power switch to RESET/OFF and then ON to reenergize goggles.	If damaged, refer to higher level of maintenance.

Section III. Operator's Maintenance Procedures

3-2 CLEANING THE NVG

CAUTION

- The goggles are a precision electro-optical instrument and must be handled carefully.
- Do not scratch the external lens surfaces or touch them with your fingers.
- Wiping demist shields with lens paper while wet or with wet lens paper can damage the coating.

Clean goggles with water if necessary and dry thoroughly. Clean lenses with lens paper (and water if necessary, except for demist shields). Demist shields must be dry before being cleaned with dry lens paper.

3-3 HEADMOUNT MAINTENANCE

(1) Browpad Replacement. Replace the browpad when cracked, torn, or contaminated.

(a) Firmly grasp the headmount and remove the old browpad.

(b) Gently press on the new browpad. Lightly smooth out any wrinkles in the new browpad.

(2) Neck Pad Reinstallation. During operation of the goggles, it is possible for the neck pad to become separated from its position on the headband. Perform the following procedure to reinstall the neck pad.

(a) Lift the upper strap retention tab (see Figure 3-1) allowing the neck pad strap to be inserted underneath.

(b) Slip the neck pad strap all the way under the upper strap retention tab and then pull the lower part of the neck pad strap under the lower strap retention tab.

(c) Repeat steps (a) and (b) for the other side of the headband and neck pad if necessary.

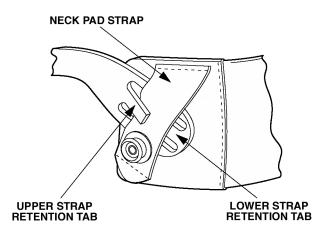


Figure 3-1. Reinstalling the Neck Pad.

(3) Threading the Sliding Bar Buckles. While donning and adjusting the headmount, it is possible for a strap to slip out of a slide fastener. If necessary, reinstall as follows:

(a) Thread the strap from the inside of the buckle over the moveable sliding bar (see Figure 3-2). Thread the strap back through the buckle but this time under the moveable sliding bar and over the serrated part of the buckle.

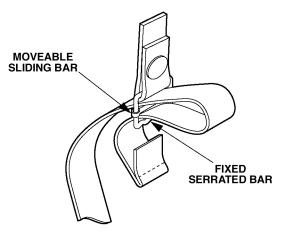


Figure 3-2. Threading the Sliding Bar Buckles.

(b) Pull the strap through the buckle and tighten as necessary.

(c) Repeat steps (a) and (b) for any other straps and buckles that may have come undone.

3-4 NECK CORD MAINTENANCE

The neck cord (Figure 1-1) may be broken, frayed, or loose at one or both ends.

If loose, re-tie cord. If broken or severely frayed, replace cord as follows:

- (1) Insert ends through rear cover plate holes from the rear.
- (2) Thread right cord end through hole in objective lens cap.
- (3) Tie a knot in each end.

APPENDIX A REFERENCES

A-1 SCOPE

This appendix lists all the forms, field manuals, technical manuals, and miscellaneous publications referred to in this manual.

A-2 FORMS

Inspection and Maintenance Record	DA 2404
Product Quality Deficiency Report	SF 368
Recommended Changes to Publications and Blank Forms	DA 2028
A-3 FIELD MANUALS	
First Aid for Soldiers	FM 21-11
A-4 TECHNICAL MANUALS	
A-4 TECHNICAL MANUALS Operator's and Unit Maintenance Manual (including Repair Parts and Special Tools List) for Test Set, Electronic Systems, TS-4348/UV	TM 11-5855-299-12&P

APPENDIX A REFERENCES - Continued

A-5 MISCELLANEOUS PUBLICATIONS

Army Medical Department Expendable/Durable Items	CTA 8-100
Consolidated Index of Army Publications and Blank Forms	DA Pam 25-30
Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items)	CTA 50-970
The Army Maintenance Management System (TAMMS)	DA Pam 738-750
A-6 MARINE CORPS USE	
Equipment Record Procedures	TM 4700-15/1
Marine Corp Publication Distribution System	MCPDS
Recommended Changes to Publications/Logistics-Maintenance Data Coding	NAVMC 10772
A-7 AIR FORCE USE	
Quality Deficiency Report General Shop Practice Requirement Maintenance and Recoverability Coding	00-35D-34 00-25-234 00-25-195

APPENDIX B COMPONENTS OF END ITEM (COEI) AND BASIC ISSUE ITEMS (BII) LISTS

INTRODUCTION

B-1 SCOPE

This appendix lists COEI and BII for the AN/PVS-7B and AN/PVS-7D to help you inventory items for safe and efficient operation of the equipment.

B-2 GENERAL

The COEI and BII information is divided into the following lists.

Components of End Item (COEI). This list is for information purposes only and is not authority to requisition replacements. These items are part of the AN/PVS-7B and AN/PVS-7D. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Items of COEI are removed and separately packaged for transportation or shipment only when necessary. Illustrations are furnished to help you find and identify the items.

Basic Issue Items (BII). These essential items are required to place the AN/PVS-7B and AN/PVS-7D in operation, operate it, and to do emergency repairs. Although shipped separately packaged, BII must be with the AN/PVS-7B and AN/PVS-7D during operation and when it is transferred between property accounts. Listing these items is your authority to request/requisition them for replacement based on authorization of the end item by the TOE/MTOE. Illustrations are furnished to help you identify the items.

B-3 EXPLANATION OF COLUMNS IN THE COEI LIST AND BII LIST

Column (1), Illus Number. Gives you the number of the item illustrated.

Column (2), National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (3), Description CAGEC, and Part Number. Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The stowage location of COEI and BII is also included in this column. The last line below the description is the CAGEC (commercial and Government entity code) (in parenthesis) and the part number.

Column (4), Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

<u>Code</u>	<u>Used on</u>
HKG	AN/PVS-7B
LDF	AN/PVS-7D

Column (5), Unit of Measure (U/M). Indicates how the item is issued for the National Stock Number shown in column (2).

Column (6), Qty Rqr. Indicates the quantity required.

Supply System Responsibility. (Marine Corps Only) A list of items that are furnished with and must be turned in with the end item. Any item requiring replacement is the responsibility of the holding organization or using unit.

Collateral Material. (Marine Corps Only) A list of items that are supplied with the initial issue of an end item and also retained by the unit.

5th Echelon Rehabilitation Program. (Marine Corps Only) Major items returned under this program will be evacuated under the provision(s) of the applicable Marine Corps Order(s) with items listed under "Supply System Responsibility" rebuild and replacement under the 5th Echelon Rehabilitation Program will be limited to these items only. Those items under the heading Collateral Material and using unit items shall be held by holding organizations/using units for application to replacement end items.

Components of End Item (Marine Corps Supply System Responsibility)

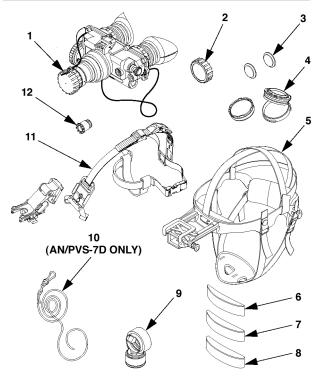


Figure B-1. Components of End Item (Sheet 1 of 2).

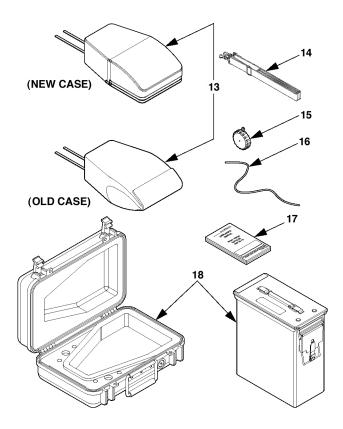


Figure B-1. Components of End Item (Sheet 2 of 2).

Table 1. Components of End Item List.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
1		GOGGLE ASSEMBLY (80063) A3144261-1	HKG	EA	1
1		GOGGLE ASSEMBLY (80063) A3144261-2	LDF	EA	1
2	5855-01-246-8271	WINDOW, SACRIFICIAL (80063) A3144264		EA	1
3	5855-01-246-8272	DEMIST SHIELD ASSY (80063) A3144263		EA	2
4	5855-01-379-1410	FILTER, INFRARED LIGHT (54490) 5009737		EA	1

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Table 1. Components of End Item List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
5	5855-01-246-8266	HEADSET ASSEMBLY (80063) A3144268		EA	1
6	5855-01-355-8599	BROWPAD ASSY, THIN (80063) A3144280		EA	1
7	5855-01-355-8600	BROWPAD ASSY, MEDIUM (80063) A3144435		EA	1
8	5855-01-297-7847	BROWPAD ASSY, THICK (80063) A3144436		EA	1
9	5855-01-381-6052	COMPASS ASSEMBLY (80063) A3187430	LDF	EA	1
10	5340-01-451-7737	CLIP, RETAINING (80063) A3260933	LDF	EA	1

Table 1. Components of End Item List - Cont

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
11	5855-01-457-2953	MOUNT, VIEWER (80063) A3256368 or	LDF	EA	1
11	5855-01-441-0401	MOUNT, VIEWER (80063) A3260927	HKG	EA	1
12	5855-01-382-5169	LENS ASSEMBLY, FOCUS (80063) A3187441	LDF	EA	1
13	5855-01-246-8269	CASE, CARRYING (OLD) (80063) A3144262	HKG	EA	1
13	5855-01-398-4284	CASE, INFRARED EQUIP (NEW) (80063) A3187392		EA	1
14	5855-01-250-2431	STRAPPING (80063) A3144267		EA	1

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Table 1. Components of End Item List - Continued.

(1) ILLUS NUMBER	(2) NATIONAL STOCK NUMBER	(3) DESCRIPTION, CAGEC, AND PART NUMBER	(4) USABLE ON CODE	(5) U/M	(6) QTY RQR
15	5855-01-397-6608	CAP, PROTECTIVE, DUST (80063) A3144318		EA	1
16	4020-01-446-8097	CORD, FIBROUS (80063) A3144306		EA	1
17		OPERATOR'S MANUAL TM 11-5855-262-10-2		EA	1
18	5855-01-246-6805	CASE, SHIPPING (80063) A3144257	HKG	EA	1
18		CASE, SHIPPING/STORAGE (80063) A3264350		EA	1

Not Applicable

APPENDIX C ADDITIONAL AUTHORIZATION LIST (AAL)

INTRODUCTION

C-1 SCOPE

This appendix lists additional items you are authorized for the support of the AN/PVS-7B and AN/PVS-7D.

C-2 GENERAL

This list identifies items that do not have to accompany the AN/PVS-7B and AN/PVS-7D and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA, or JTA.

C-3 EXPLANATION OF COLUMNS IN THE AAL

Column (1), National Stock Number (NSN). Identifies the stock number of the item to be used for requisitioning purposes.

Column (2), Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). Identifies the Federal item name (in all capital letters) followed by a minimum description when needed. The last line below the description is the CAGEC (in parentheses) and the part number.

Column (3), Usable On Code. When applicable, gives you a code if the item you need is not the same for different models of equipment.

<u>Code</u>	Used on
HKG	AN/PVS-7B
LDF	AN/PVS-7D

Column (4), Unit of Measure (U/M). Indicates how the item is issued for the National Stock Number shown in column (1).

Column (5), Qty Recm. Indicates the quantity recommended.

Using Unit Responsibility. (Marine Corps Only) A list, in alphabetical sequence, of items that will not be issued with the end item. They must be requisitioned, as required, through the supply system by the holding organization or the using unit.

Table 1. Additional Authorization List. (Marine Corps Using Unit Responsibility)

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, CAGEC, AND PART NUMBER	(3) USABLE ON CODE	(4) U/M	(5) QTY RECM
6135-01-090-5365	BATTERY, NON- RECHARGEABLE (80058) BA-5567/U		EA	1
6135-00-985-7845	BATTERY, NON- RECHARGEABLE (80058) BA-3058/U		EA	2
6135-01-333-6101	BATTERY, NON- RECHARGEABLE (83740) L91		EA	2
6625-01-323-9584	TEST SET, ELECTRONIC TS-4348/UV (80063) A3139775		EA	1
5855-01-381-6052	COMPASS ASSEMBLY (80063) A3187430	HKG	EA	1

Table 1. Additional Authorization List - Continued.

(1) NATIONAL STOCK NUMBER	(2) DESCRIPTION, CAGEC, AND PART NUMBER	(3) USABLE ON CODE	(4) U/M	(5) QTY RECM
5855-01-382-5169	LENS ASSEMBLY, FOCUS (80063) A3187441	HKG	EA	1
5855-01-441-0401	MOUNT, VIEWER (80063) A3260927	HKG	EA	1
5340-01-451-7737	CLIP, RETAINING (80063) A3260933	HKG	EA	1
5855-01-423-0817	MAGNIFIER LENS ASSEMBLY (80063) A3256391		EA	1

2

APPENDIX D EXPENDABLE AND DURABLE ITEMS LIST

INTRODUCTION

D-1 SCOPE

This appendix lists expendable and durable items that you will need to operate and maintain the AN/PVS-7B and AN/PVS-7D. This list is for information only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (Except Medical, Class V Repair Parts, and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

D-2 EXPLANATION OF COLUMNS IN THE EXPENDABLE/DURABLE ITEMS LIST

Column (1) - Item Number. This number is assigned to the entry in the list and is referenced in the narrative instructions to identify the item (e.g. "Use lubricating oil, item 25, Appendix D").

Column (2) - Level. This column includes the lowest level of maintenance that requires the listed item (C =Operator/Crew).

Column (3) - National Stock Number. This is the NSN assigned to the item, which you can use to requisition it.

Column (4) – Item Name, Description, Commercial and Government Entity Code (CAGEC), and Part Number (P/N). This column provides the other information you need to identify the item.

Column (5) - Unit of Measure (U/M). This code shows the physical measurement or count of an item, such as gallon, dozen, gross, etc.

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Table 1. Expendable and Durable Items List.

(1)	(2)	(3)	(4)	(5)
ITEM NUMBER	LEVEL	NATIONAL STOCK NUMBER	ITEM NAME, DESCRIPTION, CAGE, PART NUMBER	U/M
1	C	6640-01-459-4239	PAPER, LENS (81348) A-A-50177, TYPE I, CLASS 5	РК

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THE METRIC SYSTEM AND EQUIVALENTS

'NEAR MEASURE

. Centimeter = 10 Millimeters = 0.01 Meters = 0.3937 Inches

- 1 Meter = 100 Centimeters = 1000 Millimeters = 39.37 Inches
- 1 Kilometer = 1000 Meters = 0.621 Miles

VEIGHTS

Gram = 0.001 Kilograms = 1000 Milligrams = 0.035 Ounces 1 Kilogram = 1000 Grams = 2.2 lb.

1 Metric Ton = 1000 Kilograms = 1 Megagram = 1.1 Short Tons

LIQUID MEASURE

1 Milliliter = 0.001 Liters = 0.0338 Fluid Ounces

1 Liter = 1000 Milliliters = 33.82 Fluid Ounces

APPROXIMATE CONVERSION FACTORS

APPROXIMATE CONVERSION FACTORS			
TO CHANGE	το	MULTIPLY BY	
Inches	Centimeters	2.540	
Feet	Meters	0.305	
Yards	Meters	0.914	
Miles	Kilometers	1.609	
Square Inches	Square Centimeters	6.451	
Square Feet	Square Meters		
Square Yards	Square Meters		
Square Miles	Square Kilometers		
Acres	Square Hectometers	0.405	
Cubic Feet	Cubic Meters		
Cubic Yards	Cubic Meters		
Fluid Ounces	Milliliters		
1ts	Liters		
arts	Liters		
allons	Liters		
Ounces	Grams		
Pounds	Kilograms		
Short Tons	Metric Tons		
Pound-Feet	Newton-Meters		
Pounds per Square Inch	Kilopascals		
Miles per Gallon	Kilometers per Liter		
Miles per Hour	Kilometers per Hour	1 600	
Mines per mour	Infometers per flour	1.003	
TO CHANGE	то	MULTIPLY BY	
TO CHANGE Centimeters	TO Inches		
		0.394	
Centimeters	Inches	0. 394 3.280	
Centimeters Meters Meters Kilometers	Inches Feet	0.394 3.280 1.094	
Centimeters Meters Meters Kilometers	Inches Feet Yards Miles	0.394 3.280 1.094 0.621	
Centimeters Meters Meters Kilometers Square Centimeters	Inches Feet Yards Miles Square Inches	0.394 3.280 1.094 0.621 0.155	
Centimeters Meters Meters Kilometers Square Centimeters Square Meters	Inches Feet Yards Miles Square Inches Square Feet	0.394 3.280 1.094 0.621 0.155 10.764	
Centimeters Meters Meters Kilometers Square Centimeters Square Meters Square Meters	Inches Feet Yards Miles Square Inches Square Feet Square Yards	0.394 3.280 1.094 0.621 0.155 10.764 1.196	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers .	Inches Feet Yards Miles Square Inches Square Feet	0.394 3.280 1.094 0.621 0.155 10.764 1.196 0.386	
Centimeters Meters Meters Kilometers Square Centimeters Square Meters Square Meters	Inches Feet Yards Miles Square Inches Square Feet Square Yards Square Miles	0.394 3.280 0.621 0.155 10.764 1.196 0.386 2.471	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters .	Inches Feet Yards Miles Square Inches Square Feet Square Yards Square Miles Acres Cubic Feet	0.394 3.280 0.621 0.155 10.764 1.196 0.386 2.471 35.315	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters . Cubic Meters .	Inches Feet Yards Miles Square Inches Square Feet Square Yards Square Miles Acres	0.394 3.280 1.094 0.621 0.155 10.764 1.196 0.386 2.471 35.315 1.308	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters .	Inches Feet	0.394 3.280 1.094 0.621 0.155 10.764 1.196 0.386 2.471 35.315 1.308 0.34	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters . Milliliters . Liters .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters . Cubic Meters . Milliliters .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters Meters Meters Kilometers Square Centimeters Square Meters Square Meters Square Kilometers Square Hectometers Cubic Meters Cubic Meters Milliliters Liters Liters.	Inches Feet Yards Miles Square Inches Square Feet Square Yards Square Miles Acres Cubic Feet Cubic Yards Fluid Ounces Pints. Quarts Gallons	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters . Cubic Meters . Milliliters . Liters . 'ers . ms .	Inches Feet Yards Miles Square Inches Square Feet Square Feet Square Miles Acres Cubic Feet Cubic Feet Cubic Yards Fluid Ounces Pints. Quarts Gallons Ounces	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Kilometers . Square Hectometers . Cubic Meters . Cubic Meters . Milliliters . Liters . Liters . .ograms .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Square Centimeters . Square Meters . Square Meters . Square Meters . Square Hectometers . Cubic Meters . Cubic Meters . Cubic Meters . Milliliters . Liters . Liters . ograms . Metric Tons .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Square Centimeters . Square Meters . Square Meters . Square Meters . Square Hectometers . Cubic Meters . Cubic Meters . Cubic Meters . Milliliters . Liters . Liters . ograms . Metric Tons . Newton-Meters .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Square Centimeters . Square Meters . Square Meters . Square Meters . Square Hectometers . Cubic Meters . Cubic Meters . Cubic Meters . Milliliters . Liters . Liters . ograms . Metric Tons . Newton-Meters . Kilopascals .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	
Centimeters . Meters . Meters . Kilometers . Square Centimeters . Square Meters . Square Meters . Square Meters . Square Hectometers . Cubic Meters . Cubic Meters . Cubic Meters . Milliliters . Liters . Liters . ograms . Metric Tons . Newton-Meters .	Inches Feet	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	

SQUARE MEASURE

1 Sq. Centimeter = 100 Sq. Millimeters = 0.155 Sq. Inches

- 1 Sq. Meter = 10,000 Sq. Centimeters = 10.76 Sq. Feet
- 1 Sq. Kilometer = 1,000,000 Sq. Meters = 0.386 Sq. Miles

CUBIC MEASURE

1 Cu. Centimeter = 1000 Cu. Millimeters = 0.06 Cu. Inches 1 Cu. Meter = 1,000,000 Cu. Centimeters = 35.31 Cu. Feet

TEMPERATURE

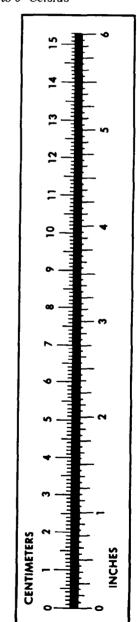
 $5/9(^{\circ}F - 32) = ^{\circ}C$

212° Fahrenheit is evuivalent to 100° Celsius

90° Fahrenheit is equivalent to 32.2° Celsius

32° Fahrenheit is equivalent to 0° Celsius

 $9/5C^{\circ} + 32 = {}^{\circ}F$



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